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EDITOR OF THE MONTH

FRED B. MOOR, M.D.
Los Angeles, Calif.

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PHYSICAL MEDICINE

November 1, 2 and 3, 1948

POSTGRADUATE MEDICAL STUDY

Arranged as Part of Program Sponsored by The University of Kansas in Cooperation with The Kansas Medical Society and the Kansas State Board of Health

UNIVERSITY OF KANSAS MEDICAL CENTER

Kansas City, Kansas

POSTGRADUATE COURSE IN PHYSICAL MEDICINE

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This important postgraduate course is one of the series arranged by the University of Kansas School of Medicine in cooperation with the Kansas Medical Society and the State Board of Health. It is especially planned for the general practitioner of medicine, and the topics will be so presented as to be of great help to him in carrying out the treatment procedures in his own office or hospital. Physical Medicine has made one of the greatest forward strides of all branches of medicine in the past ten years, and the physician who is versed in its methods, and uses them, will be carrying out his professional calling in a superior manner.

The course is offered both for doctors of medicine and for physical and occupational therapists. Every physician enrolling is invited to have his therapist attend at the special fee announced. No separate section is arranged for therapists the first two days, since many of those in attendance at the course in previous years have expressed the desire to hear more of the medical program. However, much of the program for the last day is arranged especially for therapists—although it will prove exceedingly valuable for the physician who is prescribing physical therapy and applying it in his practice.

In connection with the course, there has been arranged a display of the latest type of physical therapy equipment and of the latest editions of books pertaining to the field of Physical Medicine.

NEW HORIZONS AND CURRENT PROBLEMS IN PHYSICAL MEDICINE *

O. LEONARD HUDDLESTON, M.D., Ph.D.‡

Professor of Physical Medicine and Director, Department of Physical Medicine, University of Southern California and the Los Angeles County General Hospital.

LOS ANGELES

Progress is being made in both basic and clinical research in physical medicine. We should be proud of the efforts of the investigators who are advancing the knowledge pertaining to our field. We are progressing so rapidly that it seems worth while to pause for a moment to survey the possibilities of our specialty.

Let us examine for a moment some of our opportunities for cooperative work with our colleagues in other specialties. Take, for instance, orthopedics; it is a recognized fact that the success of many surgical procedures is assured only by the intelligent and effective use of physical therapy and occupational therapy after surgery. In neuromedicine and neurosurgery we provide numerous diagnostic and therapeutic measures which are extremely valuable in the over-all care of patients with neurologic disorders. In internal medicine, the physiatrist provides a valuable service to the internist, from the point of view of both diagnosis and treatment. His assistance is especially valuable for disorders of the soma, such as arthritis, fibrositis, arteriosclerosis and postfebrile convalescence. Hydrotherapy, electric shock therapy and therapeutic exercises are invaluable in the treatment of neurosis and psychoneurosis by the psychiatrist. These are some of the tools of physical medicine. Early ambulation, bed exercises and specific remedial exercises have proved to be of great value for speeding up the recovery of postsurgical patients. These professional interrelations between physical medicine and other specialties are well founded and have been functioning satisfactorily for many years. The prospects for developing them more are numerous.

More important than the service to other specialties are the potentialities of the intrinsic activities of physical medicine itself. The development of these is our obligation. We should become experts in the diagnosis and treatment of disturbances of motor function of the neuromuscular system and of abnormalities of connective tissue proper, particularly the collagenous system, involving ligaments, tendons, fascia, blood vessels and areolar and adipose tissue. We should excel in understanding the functional abnormalities of the articular cartilages and their relation to faulty alinement of joints. Abnormalities of these various structures present an array of diseases and disorders which should command the major interest of our specialty.

For instance, let us consider some of the special interests of the physiatrist.

Anterior Poliomyelitis. — Almost the entire treatment aside from general medical and nursing care during the acute and convalescent stages is in the field of physical medicine. The evaluation of abnormalities of the skeletal muscular system, the treatment by hot pack therapy, therapeutic exercises, gait training and the nonsurgical aspects of physical rehabilitation are entirely physical medicine. Postoperative care of patients with poliomyelitis is also largely within our sphere.

* Presidential Address read at the Twenty-Sixth Annual Session of the American Congress of Physical Medicine, Washington, D. C., Sept. 8, 1948.

‡ At present Assistant Medical Director, Kabat-Kaiser Institute, Oakland, Calif.

Nonsurgical Orthopedics. — Postural abnormalities, strains and sprains of the joints, backache and painful feet are disorders with which our specialty deals. This has not been generally appreciated. A partially satisfactory answer to the commonly expressed inquiry "what is physical medicine?" may be given by merely stating that it is principally nonsurgical orthopedics. By comparison, the physiatrist is to the orthopedic surgeon what the internist is to the general surgeon. It is my opinion that physiatrists should take this stand regarding their sphere of activity and concentrate their efforts and special talents in this field. The sooner the orthopedic surgeon recognizes that physical medicine has developed into a specialty and that the physiatrist is willing and anxious to work with him, the better it will be for every one — physiatrist, orthopedist and patient. The relationship between physical medicine and orthopedics is somewhat comparable to that which existed twenty years ago between orthopedics and general surgery.

Diagnosis. — In the past, physicians engaged in the practice of physical therapy or physical medicine have been prone to accept the diagnosis of the referring physician. Too often they have prescribed physical treatment without themselves confirming or establishing another diagnosis. It should be remembered that specialists in physical medicine are graduate physicians who have had considerable experience in diagnostic work and are therefore capable of recognizing physical and mental abnormalities, especially those pertaining to somatic structures. For instance, the symptom complex pertaining to ligamentous and fibrous contractures is frequently misdiagnosed as arthritis, neuritis, psychoneurosis or neurosis. Specialists in our field should be in a better position to make a differential diagnosis of some of these conditions because of the opportunity for broader experience and of the use of more precise diagnostic methods.

A second example may be cited — that of making a differential diagnosis between somatic and visceral disorders. Frequently we have encountered patients who were unrelieved by kidney surgery, an appendectomy or a suspension of the uterus; subsequently the persisting symptoms were found to be on the basis of sacroiliac strain. Not infrequently patients having a postural abnormality, or a malalinement of one or more articular facets of the vertebra are misdiagnosed as having gallbladder disease or a peptic ulcer. Specialists in physical medicine should be qualified to handle differential diagnosis of this type because the number of patients whose symptoms are misinterpreted and consequently incorrectly treated is unbelievably great. The physiatrist who becomes expert in the diagnosis and treatment of this group of patients will undoubtedly succeed in private practice. He will also be doing a great service to the patients and to the entire medical profession.

Arthritis. — Our most capable observers agree that physical medicine has much to offer the arthritic patient in the restoration of the function of muscles and joints. This opinion is shared also by rheumatologists throughout the country. It should become generally known that physiatrists possess a special skill in the treatment of arthritis and are in a position to render valuable service.

Fever Therapy. — Although the indications for fever therapy have markedly decreased with the development of more effective chemical agents, there is still some demand for hyperthermia in the treatment of patients who are resistant to chemotherapy or antibiotics. Fever therapy is still useful in the treatment of chorea, eye abnormalities and arthritis. It is possible that in the future there will be an increased demand for this type of therapy when the synergistic aspects of hyperthermia and drugs are better understood.

Geriatrics. — Life expectancy has increased twenty years during the past decade, and geriatrics is developing into a specialty. Experience has shown

that physical medicine in the form of physical therapy, occupational therapy and physical rehabilitation is the most effective form of therapeutics to offer this large group of patients.

Peripheral Vascular Disease. — As more people live longer there is a greater incidence of disorders of the vascular system. Although we may be on the threshold of great advances in the medical treatment of peripheral vascular disease, a need exists for mechanical equipment which can improve collateral circulation and reduce stagnation of blood and lymph. Physiatrists, therefore, have a definite service to offer the internist, the vascular surgeon, the neurosurgeon or the orthopedic surgeon who has the responsibility for the treatment of such diseases.

Neuromuscular Disorders. — Next to nonsurgical orthopedics the most important branch of physical medicine is that of dealing with the diagnosis and treatment of neuromuscular disorders.

Electrodiagnosis reveals information regarding the irritability of the peripheral nerves and skeletal muscles. It includes diagnostic tests such as the reaction of degeneration, chronaxie measurements, strength-duration curves, galvanic-tetanus ratios, estimations of neurotization and maturation times. These determinations provide information which is indispensable to the neurologists, neurosurgeons and orthopedists.

Quite recently a new method of diagnosis has become a recognized clinical laboratory procedure. Clinical electromyography is identified with physical medicine and should continue as a part of our specialty. In the future the electromyograph may be as important to the physiatrist as the electrocardiograph is to the cardiologist. The diagnostic findings of electromyography have now qualified in the courtroom as testimony equivalent to x-ray interpretations. This information is invaluable in legal medicine when the possibility of a lower motor neuron lesion is being considered. Electromyograhpic reports are of service in the evaluation and adjudication of insurance claims, disability claims and damage suits.

Electroencephalography is another diagnostic procedure which may be included in the realm of physical medicine. Examination of the brain by means of electroencephalograms gives information about cortical activity. When combined with electromyograms a fairly complete laboratory examination of the neural functions of the central and peripheral nervous system is available. These procedures may be used to evaluate the extent of upper and lower motor neuron lesions, and when used in conjunction with electrodiagnosis and voluntary muscle testing the functional status of the voluntary neuromuscular system can be assayed most effectively.

The incorporation of additional physiologic principles into existing methods of muscle reeducation has greatly extended the effectiveness of the treatment of paretic and paralyzed muscles. The principles of facilitation, irradiation, reinforcement, after-discharge and postural supporting reactions are extremely useful in establishing purposeful synaptic patterns. At times, segmental reflex behavior may be converted into voluntary activity. Muscle reeducation using these principles makes it possible to establish neurologic patterns for the control of muscular activity, which heretofore has not been accomplished. The treatment of such neuromuscular disorders as anterior poliomyelitis, cerebral palsy, multiple sclerosis, progressive muscular atrophy, syringomyelia, amyotrophic lateral sclerosis and Parkinsonism has been markedly improved by the utilization of such procedures. Advances in muscle reeducation are making the use of surgery and mechanical aids, such as splints or braces, unnecessary in the treatment of cerebral palsy. Much the same may be said, although to a less extent, for the treatment of anterior poliomyeltis and for chronic degenerative diseases of the central nervous sys-

tem. Specialists in the field of physical medicine will find it rewarding to investigate these new concepts of muscle reeducation.

Joint Manipulation. — Frequently patients present symptoms referable to malfunction of one or more joints of the body. As physiatrists, it is our responsibility to recognize and interpret these complaints. Subsequently it is our duty to relieve the symptoms and improve the physical signs by restoring the mobility of the joints. Ordinarily, this is known as manipulation. Because of the stigma associated with this term, let us concern ourselves with the result of the treatment rather than the method of treatment. Let us think of joint function in terms of mobility and regard our treatment as that of joint mobilization rather than that of adjustment or manipulation. Joint mobilization, either with or without the aid of an anesthetic, belongs to the field of physical medicine. If specialists in our field will learn this phase of treatment and use it when indicated, there will be no excuse for the constant loss of patients by the medical profession to the irregular practitioners. It is likewise the duty of medical educators to include training of this type in the medical curriculum and for those of us who are responsible for residency training programs to provide instruction in diagnosis and treatment of disorders arising from decreased joint mobility.

Rehabilitation. — The importance of rehabilitation was conclusively demonstrated during World War II, and the methods of providing this type of medical care were worked out in large measure at that time. Physical medicine instead of lay organizations should provide the leadership for the development of rehabilitation centers in various communities throughout the United States. The principle advocated by some of the leaders in the field of rehabilitation is, apparently, "make the most of what is left." This concept is inadequate. It should be, first, secure maximal functional recovery of damaged parts and, second, make the most of what is left. I urge that physical medicine adopt this policy in dealing with the plan of operation of rehabilitation centers. Physical medicine will then be in a better position to assume leadership in the development of rehabilitation projects and such leadership is badly needed.

Just one year ago physical medicine became a specialty. Great strides have been made, and we must consolidate our gains and clarify our objectives.

Now that we have looked at the present and glimpsed at the future, let us find out what some of our problems are and then ask ourselves what we are going to do about them.

We see a brand new specialty with only a handful of qualified physiatrists and countless vacancies on the staffs of hospitals, institutions and clinics caused principally by the scarcity of well trained physiatrists. How can there be serious doubt concerning the economic potentialities of a career in physical medicine?

Physical medicine and physiatrists are unrecognized by many city, county, state and national organizations. Even the medical profession and medical schools are reluctant to admit us to specialty status, and there is marked inadequacy in the physical medicine training programs of undergraduate students, interns, residents and practicing physicians.

Thousands of patients go to hospitals, clinics and doctor's offices and leave without receiving the benefits of good, sound physical medicine to which they are entitled.

Physical medicine has much more to offer the medical profession and patients than is generally appreciated. Great advances have been made in this field, but there is still much to be accomplished.

A large part of physical medicine treatment is regarded as empirical. Some of us are willing to accept treatment which is based on tradition and

custom without further investigation. Others of us feel that exhaustive tests should be used to measure and record the physiologic effects of physical agents. Only by using the methods of the other specialties can we hope to maintain and advance our own specialty. For example, the internist periodically measures the hemoglobin, red cell count and reticulocyte cell count to assay the effects of liver extract; he makes repeated tests for sugar in the blood and urine of diabetic patients receiving insulin; he determines the prothrombin time of patients receiving anticoagulant therapy, and he makes repeated electrocardiograms of cardiac patients receiving digitalis or quinidine. Likewise, the physiatrist should use goniometer and ergographic measurements, skin and muscle temperature measurements, electrodiagnostic methods, electromyography, electroencephalography, plethysmographic determinations, vital capacity measurements and various kinds of sound recording determinations in conjunction with the treatment of his patients. These should be used in physical medicine during the course of treatment to evaluate properly the extent of functional abnormalities of tissues at various times during the course of treatment. When this is done, the assay procedures become an integral part of the treatment. Diagnostic tests may also be used for prognosis and for evaluating the extent of disability. This is, of course, invaluable in formulating a program of treatment to be followed in physical medicine.

Turbulence suggesting organized opposition to our progress appears to be developing. We should recognize the danger signals and work with unity of purpose and coordinate our efforts to advance our specialty.

What is to be done about these problems? I can offer a few comments which may serve as a partial answer.

We must realize that drastic changes are taking place in physical medicine. The old formula of heat, massage and exercise is no longer adequate. Let us keep in mind the teaching of Aristotle, "Movement is life." Let us adopt the three M's as our slogan for physical medicine: mobilization, motivation and movement. Mobilization to secure full range of motion of the joints; motivation to create a desire to move; movement to participate actively in locomotion and other muscular activity.

Secure maximal functional return of involved parts before evaluating the status of a patient for the ultimate rehabilitation program. Let us emphasize three principles in our code of rehabilitation — the three C's of rehabilitation: courage, confidence and competence. Of necessity and desire, these must overlap the foregoing category. These principles of rehabilitation supplement the precepts of physical therapy and occupational therapy and enhance the recovery of the patient.

As President, I accept the responsibility of the office. I will work toward the solution of our problems. I ask your wholehearted support. Without it nothing can be accomplished. I urge each of you to accept the problems I have outlined as your problems and do whatever is in your power to work out their solution in your community. I further propose to refer these problems to appropriate standing committees and solicit their help. However, they cannot do all the work, and we need your help.

The following suggestions are your assignments:

Qualify yourselves as experts in the diagnostic and treatment procedures suggested in the present survey of the field of physical medicine.

Advocate proper development of physical medicine departments in institutions and insist that they be placed under the direction of qualified physiatrists, or at least physicians who have had special training in physical medicine.

Promote an adequate training program for doctors. Those of you who

are engaged either directly or indirectly with medical education must insist that more time be devoted to physical medicine. Pay more attention to the training of medical students and doctors in the art of physical medicine. Both physicians and patients must be taught the benefits of physical medicine.

Correct the misinformation about the economics of private practice in physical medicine. Give at least moral support to the private clinics and institutes of physical medicine that are developing in different regions of the country. Refer patients to them when special diagnosis and therapeutic facilities are indicated.

In closing, let me emphasize again that progress in our specialty and respect from the rest of the medical profession can follow only internal harmony. Let us work together. Let us be honest, fearless, courageous, cooperative, progressive, considerate and, above all, tolerant.

PHYSICAL MEDICINE IN ORTHOPEDIC SURGERY

FRANK R. OBER, M.D.

BOSTON

In general, the orthopedic surgeon has long recognized the value of physical therapy measures in the rehabilitation of the physically handicapped.

The literal translation of the name of this specialty, "to make the child straight," does not adequately define the field of orthopedic surgery, since the removal or prevention of deformity is only a preliminary step in improving function. It must be remembered that the physiology of deformity is an important factor in loss of function and that when a deformity has been corrected one has still a job to do in improving the function of the corrected part so that the patient will receive the utmost benefit. In the case of joints a good rule to observe is that, given a poor joint plus poor muscles which control that joint, the joint represents a real disability and will continue to do so unless something is done about it. It may be necessary to accept poor joint structure, but it is not necessary to accept poor muscle function, provided the innervation or a disease has not destroyed the controlling muscles. Physical therapy measures, used with judgment, will help to bring these muscles back to normal, and once this has been done a liability has been turned into an asset.

An imperfect joint that is used like a perfect joint will usually deteriorate if there is not musculature to protect it and help its function.

No joint must be allowed to sustain a load beyond its function, since to do so will increase the atrophy of its muscles which always occurs after injury or disease; it should also be borne in mind that a surgical procedure is an injury, and it too must be combated in any planned after-care.

Any physical measure which produces lasting pain must be abandoned or modified, since pain induces protective muscle spasm, interferes with the neuromuscular mechanism and contributes to an increase in muscle atrophy. Stretching procedures to relieve contractures may cause temporary pain, but if they are properly performed the pain should not last over an hour and will not be harmful. Pain which continues for twenty-four hours must be considered as deleterious.

Pain and swelling are combated with ice packs, cold compresses or heat. Some persons do not tolerate heat; in fact, it may make the condition worse.

Heat and cold must be used judiciously. Extremes of either are too often bad treatment.

No joint is cured by being cooked all day and all night. Heat is used for a specific purpose — that is, to improve the circulation and relieve spasm. The prolonged use of heat is very liable to cause stasis which defeats its purpose.

Pain is further relieved by rest in a comfortable position, by sedatives and by smooth dressings. A wrinkle in a wound dressing or an indentation in a plaster splint are too often due to carelessness in applying dressings over fresh wounds or bony prominences. Also, a wrinkled dressing may result in improper healing of that wound.

Massage

Massage is a valuable asset in the management of orthopedic disabilities. It improves the circulation but does not remove muscle atrophy. When properly used, it helps to relieve muscle spasm and pain. Massage should be gentle and should never hurt. That type of massage which digs deep into muscles to remove so-called knots is more apt to be harmful than beneficial and too often results in more pain and increased muscle spasm, thereby defeating its purpose.

Massage alone will not restore function and should be considered as an aid to other physical measures. It is contraindicated in very acute leions attended with pain and muscle spasm. It is a good physical therapy technician who knows when not to use massage.

Passive Motion

The physical medicine instruction given to most students is: baking, massage and passive motion. It is not to be wondered at that medical students know so little about physical therapy, because this sort of teaching has no meaning whatever.

Passive motion or exercise has a very limited field. It should be gentle and guarded. It is useful in moving joints within the limits of discomfort and helps to restore the patient's joint sense. It helps in the relief of muscle spasm, and again should be done gently, and it is indicated in joint or periartcular conditions in which there are adhesions plus a little motion. It does not remove muscle atrophy.

Electricity

There are many patients who have lost muscle function after injury to a joint, without nerve damage, but who are unable to contract the extensor muscles which extend the joint. The use of the Bristow coil will stimulate such muscles to contract, and when this has happened a few times the patient is able to carry on. This coil also helps to restore muscle power and tone when used regularly.

Electric stimulation is sometimes useful in stimulating seemingly paralyzed muscles after cerebral accidents. It does not restore power in total paralysis. It has been shown that it will prevent rapid muscle degeneration after a nerve has been severed.

Active Exercise

Active exercises to restore muscle tone are probably the most valuable of all physical therapy aids, and, given a single choice of all the procedures, it is best to choose active exercises as being the most helpful and most productive in restoring function to an injured joint.

Active exercise may be divided into (1) simple muscle contractions; (2) active plus passive or assisted exercise; (3) active exercises confined to

movement of the joint, without weight bearing, and (4) active weight-bearing exercises.

1. Simple muscle contractions are adapted to all convalescent patients, to the aged and to any single muscle or to a group of muscles.

There is a good deal of discussion in the current literature on getting surgical patients out of bed early, but nothing is said about how to get convalescent medical patients out of bed early. When a person has been in bed for a short time, all his muscles lose tone and strength. As time goes on, increasing muscle atrophy is added.

The greater the loss of muscle tone and strength and the atrophy, the longer it takes the patient even to get about. The orthodox manner of treating the convalescent is to let him begin sitting up at intervals. Later he is told to dangle his legs over the side of the bed. Still later he is allowed to sit up in a chair for short periods, which are then increased; then some one comes along and with the help of others he is made to stand up and finally he is told to walk, which he does, usually assisted when he finds himself staggering down the room. All this is bad and takes much time.

The time element may be materially shortened, the convalescence made more rapid and hospital beds freed earlier, relieving what is now a serious situation in overcrowded hospitals. Muscle contractions can be taught to anyone who has even a small degree of intelligence. The simplest thing to do is to tell the patient to make his quadriceps muscles tight on both legs. Some intelligent patients seem to be stupid at first, but with a little patience success will come in a few minutes.

These contractions or muscle settings are done slowly, gently and firmly, beginning with a few at a time in order not to fatigue the muscle performing them, every half hour and gradually increasing until three hundred are done daily. Once this has been learned, the patient is taught to do the same thing to his calf and buttock muscles. It is important to begin with the leg muscles, because a rapid restoration to normal function in them means that he will walk sooner.

After the patient has learned to do all this, it is easier for him to learn to do similar exercises for his back and abdominal muscles. The back and posterior neck muscles are contracted by arching the neck and back at regular intervals. The abdominal and anterior neck muscles are strengthened by raising the head and shoulders 4 or 5 inches from the bed. Deep breathing exercises help the abdominal, chest and diaphragm muscles.

The arms can be exercised in the same way, beginning with the hands. The patient makes a slow fist, then flexes, extends, rotates, adducts and abducts the wrist. The fingers are released with some tension, separated, approximated and dorsiflexed. The next step is flexion and extension of the elbow and supination and pronation of the forearm. From this one proceeds to the shoulder, which is abducted, flexed, extended, hyperextended, rotated, elevated and adducted in the manner described for the hand. Once the patient has learned the whole program, he can combine leg, back, neck, chest, abdominal and all arm exercises in one effort for all instead of in separate groups.

Several years ago I had a patient, an old man, who wore a 5 inch high sole to relieve the apparent shortening of an adducted arthritic hip. In addition, crutches were necessary. His good knee went to pieces. He was taught quadriceps exercises, and the knee got well. This man was very intelligent. He was a reviewer and did his own typing. His limit was two hours a day, owing to general fatigue from lack of exercise. He deduced that, since quadriceps exercises had made his knee strong, he might get general exercise by setting all his muscles every day. After six months he found he was typing eight hours a day without fatigue.

This form of exercise is well adapted to the old, whose chief disabilities are going up stairs, arising from a chair and walking, the principal reason being that the quadriceps and gluteal muscles do not function well. This form of muscle setting is especially adapted to strengthening the muscles, and it also helps the peripheral circulation.

2. Active and passive or assisted active motion should follow the period of muscle settings when the muscles have a normal contour and tone. These are well adapted to patients with proliferative arthritis and may be carried out by the use of balanced traction in the early stages, to be followed by manual movements of an assistant plus active contractions by the patient. The passive movement should not cause any pain — i. e., the arc of motion must be within the range of discomfort.

3. Active exercises should be performed at first with gravity eliminated and later, as the muscle function is restored to normal, against gravity and finally against resistance. It is senseless to try to perform exercises against resistance if it is impossible — e. g., to extend the knee against gravity.

4. Weight-bearing exercises should never be allowed until all fluid has disappeared from the knee joint, there is no thickening of the synovial membrane and no pain and the quadriceps has normal tone, normal contour and normal strength. The vastus internus is the slowest portion of the quadriceps to recover.

In single knees postoperatively there is a great variation in treatment. When one peruses reports of the armed forces and finds that only 50 per cent of the men whose knees were operated upon returned to full duty, thoughtful surgeons should begin to wonder, especially since these were all younger men. However, when some men advocate full weight-bearing in twenty-four hours, others in forty-eight and others in seventy-two, it is easy to conclude that these patients were treated by some one's clock and not according to the physiology of joints. Furthermore, there was great objection in the Army to the use of crutches, and, still further, the method of giving quadriceps exercises was bizarre to say the least. In many instances it was evident that the surgeon had never been taught the method. The giving of 1,000 quadriceps exercises a day, plus working as a patient orderly on a knee of one whose thigh resembled a string bean and in which the factor of safety was close to zero, is certainly not conducive to proper rehabilitation.

Walking on a painful knee with inadequate muscles is equivalent to singing with laryngitis — it simply does not work.

Painful shoulders resulting from old injuries, bursitis or tendinitis of the suprascapular muscle nearly always show atrophy of the deltoid muscle. Long after the shoulder has recovered from its original condition it may be painful because of the atrophy of the deltoid. This muscle may be restored to normal by the form of exercising just mentioned.

Many lame backs continue to be lame or there are recurrent attacks because no one has taught the patient to restore his corset muscles, the gluteus maximus and the abdominals. Forward bending exercises are prescribed too often. Forward bending with the legs straight is a favorite position for securing a lame back and should not be indulged in. Forward bending in the sitting position is not so bad, but no active exercise of the back should be done until the gluteus and abdominal muscles have tone, contour and strength, all of which may be secured by muscle setting followed by exercises against gravity.

No joint should be exercised if the exercise causes pain that lasts.

No weight-bearing should be allowed until the physiology of the joint is restored.

General muscle setting exercises are a beneficial form of treating convalescent patients and the aged.

OXIMETRY IN PHYSICAL MEDICINE *

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With the development of hospital physical medicine laboratories, departments of physical medicine will be concerned with all types of physical and physiologic testing. As a result, physical medicine will be able to offer to other clinical services the benefits of newer developments in physical research. An example of one of the services that can be offered is the oximeter, an instrument for measuring the oxygen saturation of arterial blood.

Oxygen is used extensively in medicine for treating a variety of diseases and clinical conditions. The usual clinical indication of the need for oxygen is the presence or absence of cyanosis. However, cyanosis cannot be determined with certainty until the oxygen saturation of arterial blood is around 80 per cent or lower. Of more importance in cases of decreased arterial oxygen saturation, or hypoxia, is the fact that the oxygen tension of the blood decreases proportionately much more than the per cent oxygen saturation of the blood (fig. 1). For example, a decrease from a normal oxygen saturation of 96 to 90 per cent oxygen saturation corresponds to a decrease from 100 to 60 mm. of mercury oxygen tension in the arterial blood. When cyanosis is usually first seen, at 80 per cent saturation, the oxygen tension is 45 mm. of mercury.

Since it is the oxygen tension of the blood which determines the amount of oxygen that reaches the cells, it is obvious that there may be a serious depletion of cell oxygen due to a lowered oxygen tension in the blood without clinical signs of oxygen lack. Therefore, clinical signs alone are not sufficient to determine the adequacy of oxygenation except in cases of severe hypoxia.

The standard laboratory methods of measuring the oxygen saturation of arterial blood are the gasometric (or Van Slyke) and the spectophotometric. Both of these methods, however, have inherent drawbacks in that they require a sample of arterial blood, a complicated laboratory analysis usually necessitating the services of a skilled technician and a prolonged time lapse between the sampling and the reported evaluation. Because of these handicaps, the use of these methods for routine determinations of the presence or absence of hypoxia is most infrequent. However, the oximeter affords another and more convenient method of measuring the oxygen saturation of arterial blood. It has the advantages of not requiring an arterial puncture except in cases of chronic hypoxia (in which an arterial sample is required for standardization), simplicity of operation and immediate and continuous results so that the effects of various treatment procedures on the arterial oxygen saturation can be determined at once.

The oximeter was first described by G. A. Millikan in 1942.[1] It was built at the request of the Army Air Forces and was used extensively during the war in aviation physiology and in altitude indoctrination of flyers.

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* From the Department of Physiology and The Baruch Laboratory of Physical Medicine, University of Minnesota Medical School and Hospital.

* Aided by a grant from the National Foundation for Infantile Paralysis.

* Read at the Twenty-Fifth Annual Session of the American Congress of Physical Medicine, Minneapolis, Sept. 5, 1947.

1. Millikan, Glenn A.: The Oximeter, an Instrument for Measuring Continuously the Oxygen Saturation of Arterial Blood in Man, Rev. Scientific Instruments 13:434, 1946.

With the end of the war it was natural that the oximeter should be adapted for medical use. It has already proved exceedingly valuable in the treatment of poliomyelitis,[2] in evaluating various cardiac conditions, particularly congenital heart diseases,[3] as an aid to surgeons and anesthetists and as a means of measuring circulation time.[4]

Description

Arterial oxygen saturation may be defined as the ratio of concentration of oxyhemoglobin to total hemoglobin. For determining photoelectrically the desired ratio, one requires the independent measurements of light absorption in two different spectral regions so chosen that they have different absorptions for the two pigments, oxyhemoglobin and reduced hemoglobin (fig. 2).

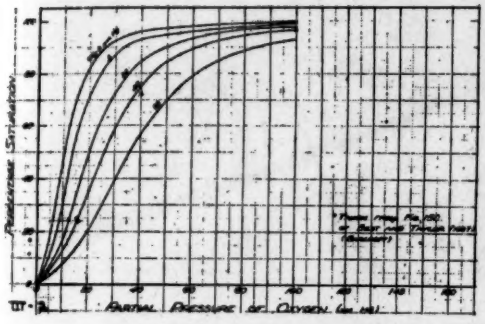

Fig. 1. — Oxygen dissociation curves of human blood with various carbon dioxide pressures (40 mm. Hg. is the normal value for carbon dioxide pressure in man). (After Barcroft.)

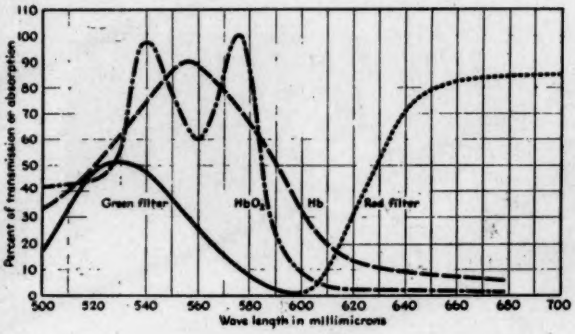

Fig. 2. — Absorption spectrums of reduced and oxyhemoglobin and transmission of Wratten filters used in the oximeter earpiece.

It is convenient to choose as one of these spectral regions or wavelength a "cross-over point,"—that is, a wavelength at which the specific absorption is equal for oxygenated and reduced hemoglobin — and to choose as the other wavelength one at which the absorption for the two pigments is very unequal. By selecting a cross-over point for the specific absorption of both pigments, oxyhemoglobin and reduced hemoglobin, the light density of the solution at that wavelength is directly proportional to the total hemoglobin concentration and is unaffected by changes in oxygen saturation.

If one assumes for a given series of readings that the total concentration of hemoglobin does not change, the light density of the solution at the cross-over wavelength must remain constant also, and the light density of the solution at the unequally absorbed wavelength will be the only independent variable.

There are at least five cross-over points for the absorption spectrums of oxyhemoglobin and reduced hemoglobin. None can be completely isolated by means of filters; however, the Wratten No. 61, or green, filter adequately fills the need. If a light passes through this filter and a hemoglobin solution and falls on a selenium barrier layer cell, the photoelectric current is practically independent of the oxygen saturation of the hemoglobin solution but is very sensitive to changes in total hemoglobin.

The spectral region lying between the wavelengths of 620 and 680 millimicrons is sensitive to changes in the oxygen saturation of hemoglobin. In this range the specific absorption of reduced hemoglobin is several times

2. Elam, J. O.; Hemingway, A.; Gullickson, G., and Vischer, M. B.: The Impairment of Pulmonary Function in Poliomyelitis, to be published.
3. Gullickson, G.; Elam, J. O., and Visscher, M. B.: Oxygenation Studies in Cases of Congenital Pulmonary Stenosis, Am. Heart J. 35:940, 1948.
4. Fowler, W. D., and Comroe, Jr., J. H.: The Rate of Increase of Arterial Oxygen Saturation Following Inspiration of 100 Per Cent Oxygen, Federation Proc. 6:104, 1947.

that of oxyhemoglobin, satisfying the requirements for widely different absorption values for the two pigments. A Wratten No. 29, or red, filter isolates this area of the spectrum.

The oximeter earpiece[4a] (fig. 3) consists essentially of a 6 to 8 volt incandescent bulb, the purpose of which is twofold: It serves primarily as a source of heat to the ear, thus dilating the capillaries and increasing blood flow so that the area beneath the light contains essentially arterial blood; secondly, it serves as a light source to act on the photoelectric cells.

Fig. 3. — The oximeter earpiece shown attached to the pinna of the ear.

Fig. 4. — The recording oximeter being used to evaluate a respirator case of poliomyelitis.

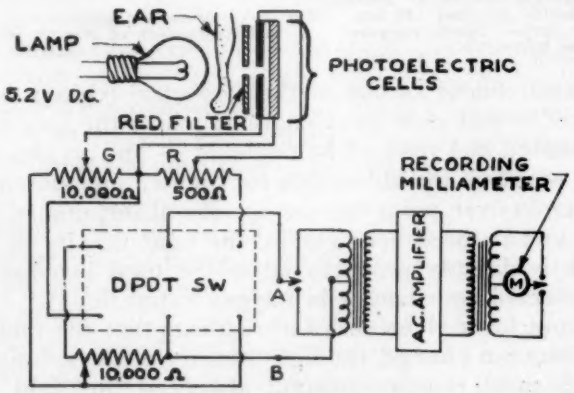

Fig. 5. — The automatic compensating oximeter circuit. A. d'Arsonval galvanometer is connected at *A* and *B* if direct readings are desired rather than a continuous record.

The two filters mentioned are contained in a small Bakelite box. The Wratten No. 29, or red, filter is placed in the center, and on each side are two Wratten No. 61, or green, filters. The filters are cemented to a single selenium barrier layer light-sensitive cell placed beneath the filters and divided into three parts to correspond to the filters. The outside cells are connected so that they actually become a single green-sensitive element on each side of a central red-sensitive element.

When placed on the ear, the green filter will allow only that light to pass which is at the wavelength for the maximum selective absorption for total hemoglobin. The red filter will allow only that light to pass which is at the wavelength for the maximum selective absorption of reduced hemoglobin alone. Thus there are produced two photoelectric currents, one of which is a measure of total hemoglobin and the other a measure of reduced hemoglo-

4a. Manufactured by Coleman Instruments, Inc., Maywood, Ill.

bin. The difference between the two values determines the amount of oxyhemoglobin present.

Cables from the earpiece are connected to a control box and then to a sensitive galvanometer or to a high gain interrupted current amplifier and a recording milliammeter (fig. 4).[5] Originally five scales were used for five arbitrary ear thicknesses — shell, wafer, thin, medium and thick — and the galvanometer zero had to be determined for each ear thickness. In 1943 Smaller[6] found that by adding a bias potentiometer and slightly rearranging the circuit (fig. 5) the "green" photocurrent could be used to compensate automatically for variations in "ear thickness" — that is, the amount of blood present in the ear — by locating the true galvanometer zero at 50 per cent on the saturation scale.

The bias potentiometer is set by placing the ear piece on a neutral filter which simulates the green transmission of the normal ear. A galvanometer, connected at *A* and *B* (fig. 5), is set at zero in midscale, and the 500 ohm red filter potentiometer is set at zero. The double throw, double pole switch is thrown to the right, and the 10,000 ohm green filter potentiometer is adjusted until the galvanometer reads full scale. The switch is then thrown to the left, and the 10,000 ohm bias potentiometer is adjusted until the galvanometer deflects in the opposite direction from zero exactly one-fifth of the reading in the right position. Once the bias potentiometer has been set, it is not changed.

In operation, the galvanometer or recording milliammeter is adjusted to the true galvanometer zero or 50 per cent on the saturation scale. The earpiece is placed on the neutral filter, the double throw, double pole switch is thrown to the left, and a green reading is obtained by having the galvanometer come to full scale deflection, or 100 per cent on the saturation scale. This procedure is necessary in order to standardize the earpiece, since earpieces vary individually. The earpiece is then placed on the ear and allowed to warm the ear for five minutes in order to obtain maximum flushing of the ear. The double throw, double pole switch is then thrown to right — the galvanometer is now connected to the red and green photoelectric cells in opposition. The green current provides zero displacement of an amount required for the specific ear thickness, while the red current causes galvanometer deflections from this offset zero. It is necessary to make an initial setting with the red potentiometer of 100 per cent on the saturation scale if the patient has been breathing 100 per cent oxygen for five minutes, or 96 per cent if one assumes that the subject has normal arterial oxygen saturation. After these procedures, the oximeter will give continuous reading of the patient's arterial oxygen saturation.

Clinical Applications

The oximeter has proved to be a valuable adjunct to the clinician, and its worth is continuing to increase. In studies of the effect of anoxia on the human body, it is invaluable, since one is able to determine accurately the oxygen saturation when certain physiologic and psychologic changes takes place over a wide range without requiring repeated arterial punctures. The anoxia is usually produced either by high altitude chambers or by breathing various percentages of nitrogen.[7]

In cases of poliomyelitis[2] the oximeter is used to determine the safe

5. Hemingway, A., and Taylor, C. B.: Laboratory Tests of the Oximeter with Automatic Compensation for Vasomotor Changes, J. Lab. & Clin. Med. 29:987, 1944.
6. Smaller, B.: United States War Department Report EXP-M-54-653-102, May 4, 1942, and EXP-M-49-696-16, Aug. 28, 1942.
7. Hemingway, A.: A Physiologic Investigation of Events Occurring When Changing from Oxygen to Air at 55,000 Feet, J. Aviation Med. 15:685, 1944.

time for liberation of patients from the respirator and the efficacy of the respirator in aiding impaired respiration. Also in cases of bulbar involvement in which tracheotomy is performed for an inadequate airway, the effect of supplementary oxygen in maintaining a normal oxygen saturation may be checked as well as the time for safely removing the oxygen and tracheotomy tube.

In congenital heart disease, particularly tetralogy of Fallot,[3] the oximeter is used preoperatively and postoperatively as a measure of cardiac reserve and to measure the effects of the operation in raising the arterial oxygen saturation. During the actual surgical procedures the instrument enables the surgeon and anesthetist to maintain the greatest possible oxygen saturation, since the usual signs of anoxia are of no avail in these already cyanotic patients.

Recently at the University of Washington, a method for determining cardiac output with the oximeter has been described.[8] Objective determination of circulation time from the lung to the ear can also be performed with this instrument.[4]

Summary

An instrument for determining arterial oxygen saturation is described with a brief review of the physics involved, the electrical circuit used and the method of operation. The instrument is simple in design and easy to construct, and, except for the ear piece, the parts for it are found in most physical medicine laboratories. A few clinical applications for its use are presented.

Discussion

Dr. Robert L. Bennett (Warm Springs, Ga.)—It would be difficult to exaggerate the value of oximetry in the care of acute anterior poliomyelitis. The clinician now has available a practical method for the early recognition of diminished oxygen in the arterial circulation. The value of this early recognition of subnormal oxygen saturation is not fully recognized by most of us. At first glance, an oxygen saturation of 95 per cent would appear to be excellent. However, if we study the Barcroft dissociation curves, we realize the relationship between oxygen saturation and oxygen pressure or tension. We find that a drop of 5 per cent in saturation seriously lowers the amount of oxygen actually "forced" into the cells of bodily tissue. We are all familiar with the fact that the functional cells of the nervous system are more sensitive to changes in oxygen content than other body cells, but we may not be aware that changes sufficient to cause serious damage to these nerve cells may occur with only minimal objective or subjective clinical findings. Before the earliest recognizable cyanosis can be seen clinically, the oxygen saturation is far below safe levels.

Certainly, all experimental evidence supports the necessity of early recognition of decreased oxygen in the arterial circulation if we are to care for our patients with acute poliomyelitis properly. It is another priceless service that experimental physiology has contributed to medicine in developing accurate and clinically practical oximetry.

8. Roos, A.; Elam, J. O.; Neville, J. F., and White, H. L.: Oximetric Determinations of Cardiac Output in Man, Federation Proc. 7:104, 1948.

ELECTRICAL TESTS OF SENSATION *

Voltage-Duration Curves of Tactile Sensation and Pain

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Therapeutic use of stimulating currents is often seriously limited by the pain or discomfort produced by the stimulus. The experiments to be reported are preliminary studies of the problem of combining maximum muscle contraction with minimum pain and deal with measurements of tactile sensation and pain produced by passage of an electric current.[1]

Fig. 1. — Method of testing tactile threshold and maximal pain.

Methods

The technic used in most of the experiments on tactile threshold and maximal pain threshold was the following. The output of a Grass Model 3 Square-Wave Generator (output impedance, 500 ohms) was led into the subject through a large indifferent electrode of cloth-covered metal foil, measuring 10.5 by 15 cm. over which the moistened left palm was placed (fig. 1). The right forefinger, also moistened with electrode paste, pressed on a small electrode, measuring 2.4 cm. in diameter, similarly cloth-covered and arranged to start the current flowing from the generator as the circuit was completed through the patient. Simultaneously with closure of the circuit, a small direct current motor geared down to 5 revolutions per minute turned the voltage control potentiometer. The stimulus to the subject was thus slowly built up at a constant rate. The subject was instructed to jerk his finger tip off the small electrode the instant he felt the slightest tickle or change in sensation or, alternately, when he was feeling maximal pain, which he could no longer bear. A reversing switch in the field of the motor was used to return the potentiometer to zero setting. Motor or sensory determinations could be made while varying the frequency (repetition rate) of the mono-

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* Dr. Rose was formerly Baruch Research Fellow in Physical Medicine, Massachusetts General Hospital, and Dr. Mead was formerly Baruch Fellow in Physical Medicine, Harvard Medical School and Massachusetts General Hospital, and Research Fellow in Medicine, Harvard Medical School.

1. In these experiments a wide variety of current sources, wave forms and measuring devices have been used. Standard radio resistors and capacitors were employed in the various circuits. Many types of electrodes were used, including the standard cloth-covered lead foil moistened and covered with electrode paste, solder buttons, needles and Lucite cups.

phasic square waves as well as their duration (range 0.05 to 20.0 milliseconds).

In the square wave experiments the output voltage of the stimulator was recorded at the instant the subject broke the circuit. At this point the direct current motor stopped turning the voltage potentiometer. Its inertia introduced a small constant reading error, into which was also lumped the patient's central reaction time.

The subjects were all young, healthy adults, about one third male and two thirds female. The same instruction was given to all. Due attention was paid to the distracting factors considered by Wolff and Goodell[2] which introduce errors into sensory testing. The subject was seated where he could not see the dial markings. An average of three to five readings was recorded as the end point for each pulse duration.

The values found are highly arbitrary and are dependent on experimental conditions, such as the speed of the direct current motor turning the potentiometer, the actual skin surface in contact with the electrodes and the degree of skin hydration, to mention but a few. In general, the instrumentation error for a single experiment was well inside the variations of psychophysiologic choice, which we estimated at ± 10 per cent.

No attempt was made to measure apparent skin resistance because, as shown by Lebel,[3] this involves many fallacies: If one uses a direct current system, there is a change in skin resistance with both voltage and time. With alternating current systems the resistance depends on the voltage and frequency used but not on the time that the current flows. Further, it is not certain that data obtained when one kind of stimulus or current is used can be applied to problems in which a different kind is used. For these preliminary experiments it was found impractical to measure the voltage drop across or current through the load.

Results

A. Sensory Experiments with Sine Waves. — Maximum pain only was tested. Within the limitations of the power output available, the frequency

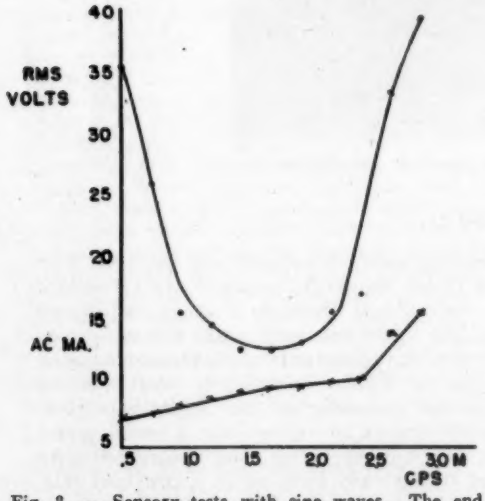

Fig. 2. — Sensory tests with sine waves. The end point registers maximum pain; the upper curve represents voltage and the lower curve current.

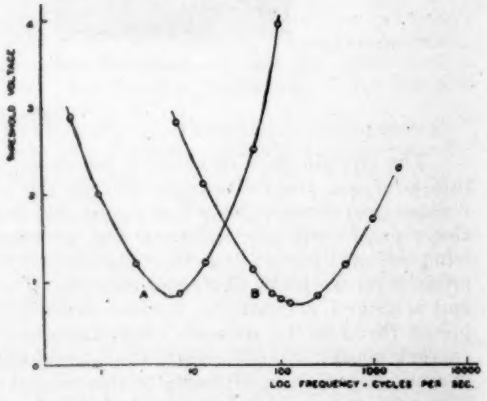

Fig. 3. — Motor charts. *A*, for foot muscle of a snail; B, for sciatic nerve of a frog.

spectrum from 20 to 3,000 cycles per second was explored. Figure 2 shows the type of curve obtained. The abscissa in this figure represents frequency in thousands of cycles per second. The power output was inadequate for a complete motor chart, but such curves have been constructed by Coppee,[4]

2. Wolff, H. G., and Goodsell, H.: Relation of Attitude and Suggestion to Perception of and Reaction to Pain, A. Research Nerv. & Men. Dis., Proc. (1942) 23:434, 1943.
3. Lebel, Claude: Personal communication to the authors.
4. Coppee, G.: Une nouvelle caractéristique chronologique de l'excitabilité: la fréquence isopotentielle, Arch. internat. de physiol. 38:251, 1934.

as illustrated in figure 3. Curve *A* is for the foot muscle of a snail, and curve *B* is for the sciatic nerve of a frog. The resemblance to our sensory measurements is striking.

The question of what component of a sinusoidal electric discharge is most responsible for the production of pain naturally arose. A complete answer to this question cannot be given, but at least voltage and power do not seem to be the answer. For a constant end point of maximum pain, the only other curve approaching constancy for most of its length is the current (lower line, fig. 2). For the square wave experiments insufficient data are available to permit comparison.

B. Sensory and Motor Voltage-Duration Curves. — With use of square waves as the stimuli, a comparison of the voltage-duration curve of maximal pain and a previously agreed on standard motor contraction was made. The standard motor contraction was, for purposes of this experiment, defined as that degree of contraction by which the tip of the finger barely touched the thenar eminence when the third or fourth slip of the flexor digitorum profundus muscle was stimulated percutaneously over its motor point. Later in the course of the experiments minimum sensory (tactile threshold) was added. Minimum pain, or pain threshold, was found to be an unreliable and inconstant end point, but maximum pain was repeatable often within 1 volt.

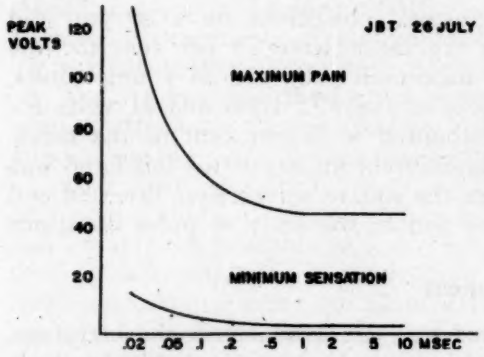

Fig. 4. — Typical curves with maximum pain and minimum sensation.

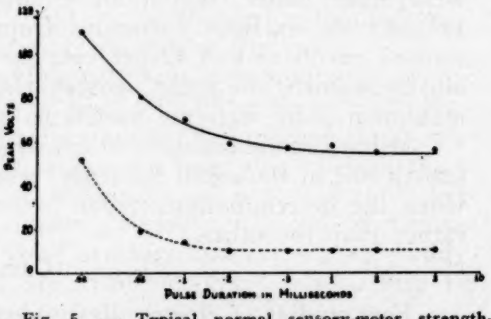

Fig. 5. — Typical normal sensory-motor strength-duration curves. Upper curve, maximum finger tip pain; lower curve, standard motor contraction (flexor digitorum profundus).

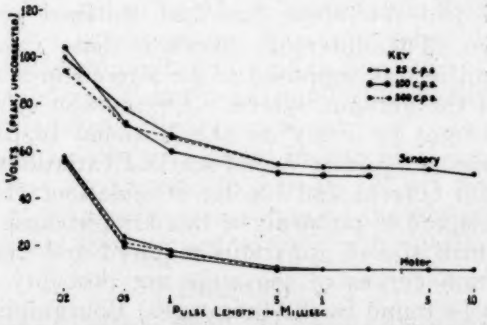

Fig. 6. — Frequency effect on pain maximum and standard motor contraction.

Figure 4 illustrates the type of curve with maximum pain and with minimum sensation. The duration of each stimulus in milliseconds is plotted on the logarithmic grid. The frequency of stimulation was 100 cycles per second. Very similar curves for minimal sensation were obtained when condenser discharges were employed as the stimulus.

Figure 5 shows the comparison on another subject between maximum

pain and standard motor contraction. The similarity between this and the preceding figure is apparent.

The effect of varying the frequency of the square wave stimulation was determined. With the frequencies available (20 to 500 cycles per second) no significant difference were noted on either the motor or the sensory end points. One merely obtained a family of close fitting curves (fig. 6). In all subsequent experiments the frequency was arbitrarily set at 100 stimuli per second.

The effect of changing the site stimulated was then investigated. Considerable changes, both qualitative and quantitative, were encountered. The palm tolerated much more energy than the finger tip, and the base of the finger was intermediate. Bony prominences, such as the ulnar styloid, were more sensitive than fleshy areas. While deep, throbbing, sometimes cutting or aching pain was usually experienced in the hand, the skin of the forehead felt a purely burning type of pain, exactly like that produced by a hot lamp. This latter site could not be used because of flicker from optic nerve stimulation, which tended to distract the subject. Because of the ease with which results could be duplicated, the finger tip of the index or third finger was used for these experiments.

Although the results during any given experiment were highly consistent, it was found that there was considerable variability in the same subject over a period of days. To test this variability, fifteen daily determinations were made under comparable environmental conditions on a 36 year old subject; the extreme variations from the mean were 75 per cent for the sensory rheobase and 42 per cent for maximum pain. In 24 young adults, mostly women, the mean sensory rheobase was 5.75 volts and 31 volts for maximum pain; extreme variations amounted to 52 per cent of the mean.

Minor differences were found when different fingers or the left hand was substituted at the small electrode, when the square waves were inverted and when the determinations began at one end of the scale of pulse durations rather than the other.

Comment

Few studies of electrically produced pain are available in the literature. The older European literature on the subject, much of it unavailable, has been summarized by Neoussikine and Abramowitsch.[5] Faradic currents were usually employed and two thresholds described, minimal sensation (*Kribbeln*) and minimum pain. The difference between these values was called the faradic interval, and it was supposed to be altered in a constant fashion in various diseases of the nervous system. Stimulation of metal tooth fillings with a galvanic current by Eddy[6] at the National Institute of Health has given inconstant results. Lanier[7] found marked variations in pain thresholds with use of constant current and bipolar stimulation. However, electricity seems admirably adapted to problems of this kind because of precise methods of measurement, small size of apparatus required and ease of control.

Strength-duration curves of sensation are probably not new, although few references can be found in the literature. Bourguignon[8] mentioned sensory chronaxie determinations but gave no details.

The significance of the strength-duration relation for motor nerves has been discussed by A. V. Hill,[9] who from certain acceptable assumptions regarding the excitation state of muscle derived mathematically a formula and

5. Neoussikine, B., and Abramowitsch, D.: Elektrodiagnostik, Bern, Hans Huber, 1939, p. 203.
6. Eddy, Nathan B.: Personal communication to the authors.
7. Lanier, L. H.: Variability in Pain Threshold, Science, 97:49, 1943.
8. Bourguignon, G.: La chronaxie chez l'homme, Paris, Masson & Cie, 1923, p. 399.
9. Hill, A. V.: The Strength-Duration Relation for Electric Excitement of Medullated Nerve, Proc. Roy. Soc. London, S. B. 119:440, 1936.

a theoretical curve to express this relationship. The formula is a complicated exponential having the general form of a condenser discharge. This theoretical curve has been found to fit closely the experimental values in motor nerve excitation. The similarity of the values for motor nerve excitation to our findings for sensory stimulation is apparent. It may be concluded then that sensory and motor nerve excitation are essentially similar processes with respect to the time-intensity relation.

That the strength-duration relation holds for other types of energy than electric currents is suggested by curves published by Bigelow, Harrison, Goodell and Wolff.[10] The form of the curve is the same as illustrated in figure 5, although the stimulus used by the authors cited was radiant energy (heat) and the time relations are in terms of seconds rather than in milliseconds.

It is important to note that the pain end points described do not correspond with threshold pain and reactive pain determined on the Wolff Hardy apparatus.[11] Threshold pain was found to be indeterminate, as was previously noted. Reactive pain — i. e., wincing, frowning, withdrawal, etc. — sometimes occurred an appreciable time before the subject took his finger off the electrode. In other subjects such reactions were never noted at all or could be suppressed. Maximal pain could not be suppressed, and interruption of the circuit at this point was almost an involuntary act.

From experiments with radiant energy, Hardy, Wolff and Goodell[12] concluded that spatial summation of painful stimuli does not occur in the skin. In our experiments the area stimulated could not be changed without changing current density; hence this observation could not be checked.

We are unprepared to say whether the maximum pain end point represents a stimulation of fast (δ fiber) pain or slow (C fiber) pain or a combination of the two. It is hoped that future investigation will bear on this point.

It is likely that fluctuations in skin impedance from day to day are in part responsible for shifting values in an individual subject. On the other hand, maximum tolerable pain may itself have a periodic character, analagous to the phasic variations in respiration, blood pressure and many other bodily functions. When more complete data are available, many applications to research and clinical work suggest themselves.

Summary

Experiments are described in which quantitative measurements of electrically produced tactile sensation and maximum tolerable pain were made.

Frequency distribution and voltage-duration curves using these end points were constructed and found to resemble closely similar determinations on motor nerves or nerve-muscle preparations.

Highly consistent results were found in individual experiments, but considerable variation was encountered in a single subject from day to day.

The reduction of a subjective sensation to the objectivity of a voltage-duration curve suggests this method to be worthy of further investigation

Discussion

Dr. Carl L. Levenson (Chester, Pa.): The authors of this paper are to be congratulated upon the development of an original and simple investigative approach to the very complicated problem of pain. This work is a pioneering attempt in physical medicine and it gives us a new tool for further exploration of pain. Its advantages over the older technic of studying pain; the thermal technic of Wolff, Hardy and Goodell; the pressures technic, and some of the chemical technics used in the past are ob-

10. Bigelow, N.; Harrison, I.; Goodell, H., and Wolff, H. G.: Studies on Pain; Quantitative Measurements of Two Sensations of the Skin, with Reference to the Nature of "The Hyperalgesia of Peripheral Neuritis," J. Clin. Investigation 24:503, 1944.

11. Chapman, W. P., and Jones, C. M.: Variations in Cutaneous and Pain Sensitivity in Normal Subjects, J. Clin. Investigation 23:81, 1944.

12. Hardy, J. D.; Wolff, H. G., and Goodell, H.: Studies on Pain: A New Method for Measuring Pain Thresholds: Observations on Spatial Summation of Pain, J. Clin. Investigation 19:649, 1940.

vious. Not only does this method reduce the number of variables with which the observer has to contend, but it reduces the study to pain itself. It eliminates such factors as fear and other reactions to pain.

The possible scope of this work is as broad as the subject of pain. It opens up a new avenue of approach, although the observers were particularly interested in specific aspects of pain. It seems to me that further study with this type of instrumentation might yield information for the development of apparatus for painless muscle stimulation as well as facts about pain itself. It also could be used possibly for a more critical study of the effects of analgesics.

The technic is very simple. The apparatus is simple. The patient is asked to keep a finger on a button and at the moment of maximum tolerance of pain remove the finger; the circuit is broken, and one has a reading. The element of fear and the patient's conscious collaboration are removed.

I should like to raise a question of which I am certain the authors are cognizant. What is the mechanism by which electrical stimuli produce pain? Secondly, I should like to see them correlate certain basic factors regarding electrical stimulation and occurrence of pain — such as, not only the voltage and the square of the current, but also the duration and frequency of current application. I, and I think others in this room, would appreciate having the authors continue further explorations in this field. I believe that they have made a valuable contribution, and that they will make other contributions of great value if they continue their studies.

PASSIVE MUSCULAR EXERCISE *

MAX A. LEVINE, M.D.

LOS ANGELES

I am presenting a concept of regulated passive muscle stretching which has afforded very satisfactory results. In the past ten years this method of postimmobilization management has been of inestimable value. There is no question in my mind that many of you have employed one form or another of passive stretch or exercise in the follow-up of prolonged immobilization after a cast or some form of traction. The purpose of this paper, however, is to present a technic with special reference to an apparatus which has proved to be invaluable in my practice. This equipment could easily and inexpensively be installed in any orthopedic office or department of physical therapy in a hospital. It consists of a modified ratchet-controlled windlass capable of exerting a considerable pull (figs. 1 and 2). The exact force of this pull is checked by a scale which is interposed between the patient and the table (stretching apparatus) (fig. 3).

In view of the fact that the results were so uniformly satisfactory in private practice a duplicate of this apparatus was made and used in the Army hospital where I was stationed. It is obvious that if those soldiers with severe disability due to very serious injury as well as prolonged immobilization were benefited by use of the apparatus, its merits are well founded.

We are all cognizant of the fact that in an injured extremity after prolonged immobilization a considerable number of adhesions will develop. The longer these are allowed to remain, the denser they become. The pathologic changes which occur in soft tissues as a result of trauma and immobilization may be summarized as follows: There is usually a hemorrhagic exudate of varying degree into the muscles and areolar tissue at the site of trauma. Inflammatory exudate and edema fluid extend for considerable distances into the adjacent soft parts and often involve the whole extremity. This is the

* From the Department of Orthopedic Surgery, Cedars of Lebanon Hospital.
* Read at the Western Orthopedic Association, Nov. 6, 1947, and the Western Hospital Association, April 21, 1948, Los Angeles.

early swelling seen, for example, after fractures, which is aggravated by dependency. Even relatively minor subacute inflammatory changes which occur after strains and sprains may cause joint stiffness by interfering with the flexibility of the areolar tissues. Normal areolar tissue is a "somewhat soft structure of great tenacity, elasticity and suppleness and, when normal, containing a small quantity of a translucent lymphlike fluid, sufficient to keep

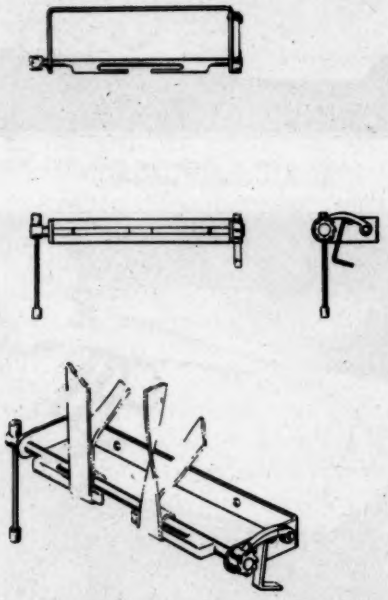

Fig. 1. — Ratchet windlass apparatus from four projections.

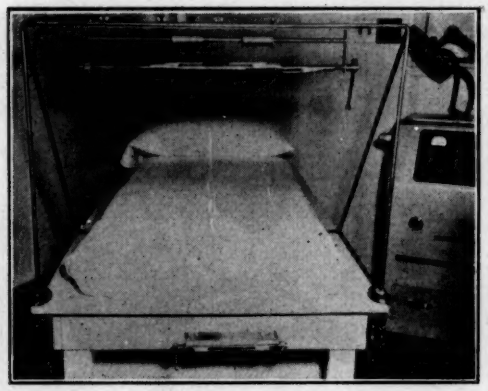

Fig. 2. — Small and large stretching apparatus attached to physical therapy table.

it moist and supple."[1] It acts as an agent for attaching various structures to one another and fills all crevices and spaces between muscles and other deep structures. Moistness and suppleness is of supreme importance to free and easy movement of parts. Creaking joints, under certain conditions, may be due merely to absence or diminution of this lymphlike lubricant of the areolar tissue. After trauma, even in minor injuries, this loss of flexibility of the areolar tissue may result in prolonged stiffness of joints and aching pains, especially when the involved limb is kept at rest for a long time. This type of stiffness is different from that produced by contractures of muscle and capsular ligaments, since it leaves soon after initial movements with removal of edema.

This stretching apparatus is extremely useful in the so-called postbursal or tendonitis adhesions about the shoulder. The patient is always to be recumbent (fig. 4). Some modality such as diathermy by drum, pads or induction cable is applied to the shoulder region. Occasionally, when the diathermy is irritating to the shoulder region, an infra-red lamp is used. During the warming period the arm is brought into its maximum range of abduction (fig. 4), and after approximately ten to fifteen minutes of such concentrated heat the shoulder is stretched rather gradually. The passive force is continued as the adhesions are either stretched or ruptured and as the muscles in spasm relax. This procedure is not without some pain. The patient is impressed with the fact that pain is to be expected, and occasionally some anodyne is given either prior to or during the stretching period. In cases in which the periarticular contracture may be secondary to a car-

1. Smart, Morton: The Influence of Muscle Action on Tissue Repair, Arch. Phys. Med. 28:429 (July) 1947.

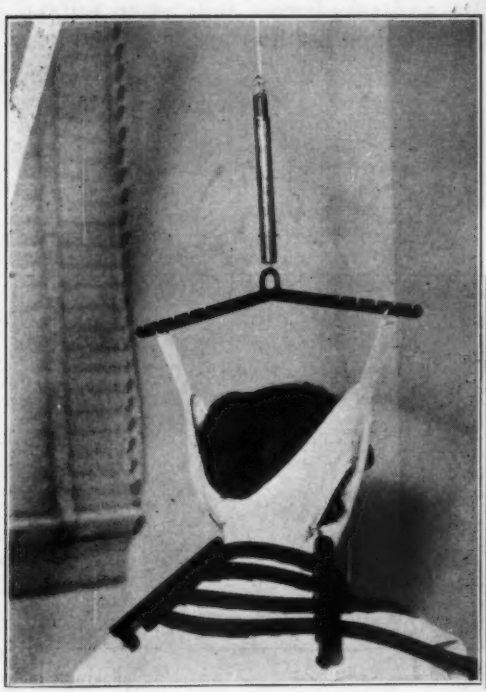

Fig. 3. — Insertion of scales to measure strength of pull.

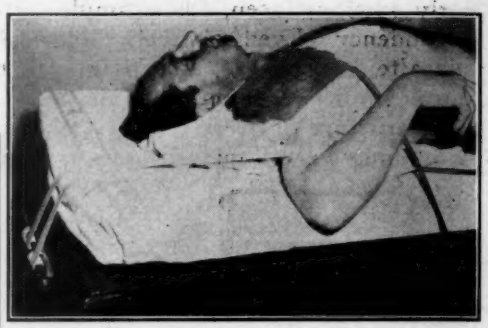

Fig. 4. — Application of diathermy pads with shoulder in maximum abduction.

Fig. 5. — Adduction of upper arm and circumferential application of induction cable.

diac dysfunction, such as coronary thrombosis, the amount of passive stretch administered is not so great as in other cases. It is also interesting to note that as the range of motion is increased by actual measurements the patients will volunteer the information that pain is less than on the previous sessions of passive muscle stretching. Furthermore, pain is experienced only at the extremes of flexion, extension or abduction. Subsequent exercises, both passive and active, are continued by the patient in the home. This form of treatment has undoubtedly afforded the best results. Even though the therapy may be protracted the end result is invariably a restoration of good function.

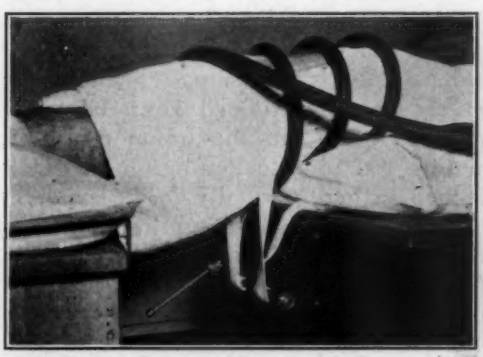

Fig. 6. — Technic of obtaining last 10 to 15 degrees of extension.

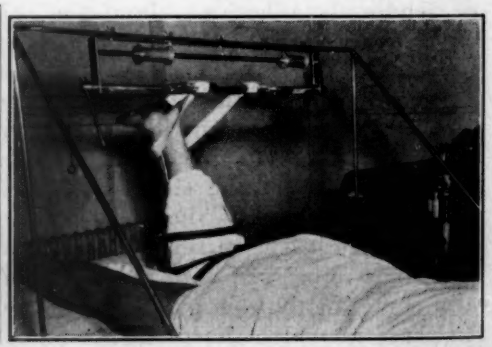

Fig. 7. — Use of wider stretching apparatus to obtain flexion.

After prolonged immobilization of the elbow, such as from traction or plaster of paris cast, there is a considerable stiffness which is difficult to mobilize. The described apparatus is definitely indicated in this type of stiffness. The upper arm is fixed in adduction, and the strap pad is anchored to the distal aspect of the forearm and the web straps to the ratchet; the diathermy cable is placed circumferentially about the upper arm and elbow (fig. 5). The technic of preheating the involved areas to allow for muscle relaxation is again used. The patient is impressed with the fact that it is necessary for him to use his flexors while the passive stretch is continued. This assisted passive movement seems to be very beneficial for muscle stimulation. One must state that it is always necessary to tighten the windlass as the muscles stretch or relax. It is also noteworthy that the therapist must stretch beyond the point of pain in order to gain any effect of this procedure. Furthermore, once the elbow is stretched beyond 80 degrees, the subsequent passive stretching is less painful to the patient. There may be a number of patients with a moderate stiffness of the elbow in flexion. These patients are also stretched with the described apparatus; however, their positions are reversed on the treatment table. These results, too, are uniformly satisfactory.

The knee joint is perhaps the one joint most commonly involved in a flexion or extension contracture. Flexion contractures are seen in forms sometimes up to 30 or more degrees in an arthritic patient. As little as a 15 degree flexion contracture in an elderly arthritis patient will evoke pain and swelling in the knee which can be extended from 170 to 180 degrees (fig. 6). Here, too, the patient is instructed to do quadriceps setting while the passive stretching is continued. This assisted passive motion aids physiologically in removing the local metabolites and promotes the elimination of carbon dioxide, which, in turn, allows for a more rapid glycogenesis. It is reasonable to assume that in passive stretch the condition of oxygen debt which is frequently present in continued active motion does not prevail.[2] Krogh has shown that the blood supply of contracting muscle in guinea pigs may reach 750 times that of resting muscle.[1]

By a similar type of apparatus an extensural contracture can be overcome by passive flexion. The technic calls for the patient to lie on the ab-

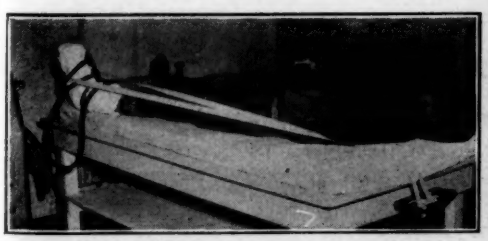

Fig. 8. — Correction of plantar flexion at ankle.

Fig. 9. — Technic of use of apparatus for passive muscle stretching of cervical portion of spine.

2. Best, C. H., and Taylor, N. B.: The Physiological Basis of Medical Practice, ed. 4, Baltimore, The Williams & Wilkins Co., 1945.

domen, and with gradual cranking of the handle of the windlass the lower leg assumes the position of flexion (fig. 7).

The ankle joint is commonly found to be in a moderate amount of flexion. The commonest cause for this plantar flexed position is the acquiescence of the doctor to the patient. The patient will frequently push the foot plantarward without proper resistance of the applicator to this position of the ankle. This position is then maintained during the prolonged immobilization in the plaster of paris cast. The technic (fig. 8) shows how the heel cord is stretched and brought back into a favorable position.

The neck is a frequent source of continued intermittent pain which, in turn, provokes a true radiculitis in either the cervical or the brachial plexus. Whether it is an arthritis with its spurs encroaching on the neural canals or a partial traumatic subluxation, cervical stretch seems to give rather early relief to this involved extremity. In the technic employed a leather head halter is attached to an adequate spreader. The rope is passed through a pulley overhead, and a spring balance between the patient and the ratchet windlass provides for gradient calibrations on weight exerted by tightening of the windlass. More specifically, a patient with radiculitis from a cervical arthritis or thin disk is placed on a high stool, and the head halter is applied (fig. 9). If a short wave drum is used, it is placed posteriorly, so that it treats the cervical portion of the spine. On the other hand, if an induction cable is available, the latter is wrapped circumferentially about the neck to the shoulders. The stretching is begun at a 10 pound pull for fifteen minutes, and at each successive treatment an additional 3 pounds and six minutes is added. The total aggregate of weight is 25 pounds and time forty-five minutes. The time and amount of pull will have to be regulated according to the type of case. In only rare instances does a patient require more than six treatments.

Summary

1. Passive stretching exercises are important in postimmobilization therapy.

2. The physiology of muscle stretch is discussed briefly. Passive muscle stretch stimulates vasodilation and increases the flow of blood toward the heart through stretching and compressing of the blood vessels.

3. A special ratchet windlass apparatus is used to facilitate the restoration of function of the various regions.

KINESIOLOGIC ELECTROMYOGRAPHY *

II. The Trapezius

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Assistant Clinical Professor of Physical Medicine, Columbia University;
Attending Physician in Physical Medicine, Mount Sinai Hospital

NEW YORK

As with other muscles which act in a group to perform a smoothly integrated movement, it is not possible to ascribe a given motion to the trapezius alone. For example, movements ordinarily attributable to the trapezius can still be performed, though incompletely and weakly, when the muscle is paralyzed after section of the spinal accessory nerve. It is possible to determine whether this particular muscle contracts during the performance of a motion. Our ultimate object is to observe the relationship of this activity to that of other muscles in the group.

We,[1] as well other investigators,[2] have attempted to utilize electromyography as an objective approach to the evaluation of muscle action. This method has its limitations, but to our knowledge it is the most exact technic available. It has yielded new and definite information. Electromyography records potentials from only a part of a muscle. In a large muscle, such as the trapezius, we assume that the adjacent fibers act similarly to those under observation. Actually, this is a valid assumption, as indicated by the fact that though it is impossible to place the electrodes in identical positions when performing the same test at different times and on different subjects the results obtained are qualitatively similar. With a coaxial needle, only those potentials produced in the vicinity of the needle are obtained. The use of two needles or of two surface electrodes permits the recording of potentials generated by the muscle fibers lying between the electrodes. We found needle electrodes to be unsatisfactory, because of pain and irritation due to the trauma they produce in the course of repeated motion. Consequently, in most of our observations we used surface electrodes.

The microvoltage is influenced by the thickness of the tissue interposed between the muscles and the electrodes, the distance between the electrodes and the position of the electrodes over various parts of the muscle. Therefore, we consider the records obtained as of qualitative rather than of quantitative importance.

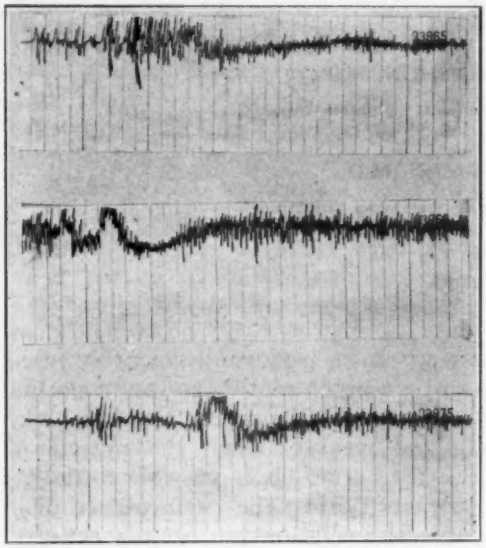
The following results represent the relatively consistent findings in a group of 10 or more normal subjects. In many instances tests were repeated on the same subject at different times. Recordings were made from the upper, middle and lower parts of the trapezius while the subjects were standing, sitting and lying down. Action potentials were graded as weak, moder-

* From the Department of Physical Medicine, Mount Sinai Hospital.

1. Bierman, W., and Yamshon, L. J.: Electromyographic Evaluation of Kinesiology, Arch. Phys. Med., to be published.

2. (*a*) Miles, M. O.; Mortensen, O. A., and Sullivan, W. E.: Electromyography During Normal Voluntary Movement, Anat. Rec., 98:209 (June) 1947. (*b*) Inman, V. T.; Saunder, J. B., and Abbott, L. C.: Function of the Shoulder Joint, J. Bone & Joint Surg. 26:1 (Jan.) 1944.

ate, moderately strong and strong. Comparisons were made when the relative position of the electrodes remained unaltered.



1 SEC I 100 MV

Chart 1. — Upper portion of trapezius; action on scapula; sitting position. *Top curve,* forward flexion of arm. *Middle curve,* abduction of arm. *Bottom curve,* adduction of shoulders.

1 SEC I 100 MV

Chart 2. — Upper portion of trapezius; extension of neck; prone position.

I. Upper Portion of the Trapezius.
   A. Standing and sitting positions.
      1. When the subject rotated his head and then extended his neck so as to point the chin upward, no action potentials were obtained. Care was taken to avoid elevating the shoulders. Action potentials were obtained in some subjects if this motion was performed against firm resistance.
      2. On lateral bending of the neck, no action potentials were recorded.
      3. On forward flexion of the neck, no action potentials were recorded.
      4. On extension of the neck, action potentials were recorded in 2 subjects. In the other subjects no potentiales were developed, even when external resistance was applied.
      5. On depression of the scapula, no action potentials were recorded.
      6. On elevation of the shoulder, strong action potentials were recorded.
      7. On hyperextension of the arm, small potentials were recorded, but they were few and sporadic.
      8. On forward flexion of the arm, moderate action potentials were recorded (chart 1).
      9. On abduction of the arm, action potentials were recorded (chart 1).
      10. On adduction (retraction) of the shoulders, moderate action potentials were recorded (chart 1).

   B. Prone.
      1. On extension of the neck, no action potentials were recorded (chart 2).

   C. Prone with left arm hanging over the side of the table; electrodes on left trapezius; movements of left arm.
      1. On forward flexion, small potentials were recorded.
      2. On abduction, small potentials were recorded.

   D. Lying on right side and moving left arm; electrodes over left trapezius.
      1. On abduction, no potentials were recorded (chart 3).
      2. On hyperextension, no potentials were recorded (chart 3).
      3. On forward flexion, no potentials were recorded.
      4. On elevation, moderately strong potentials were recorded.

II. Middle Portion of the Trapezius.

A. Vertical position.
   1. On rotation of the neck, no potentials were recorded.
   2. On flexion of the neck, no potentials were recorded.
   3. On extension of the neck, no potentials were recorded.
   4. On depressing shoulders, no potentials were recorded.
   5. On elevating shoulders, strong potentials were recorded.
   6. On hyperextension of the arm, strong potentials were recorded.

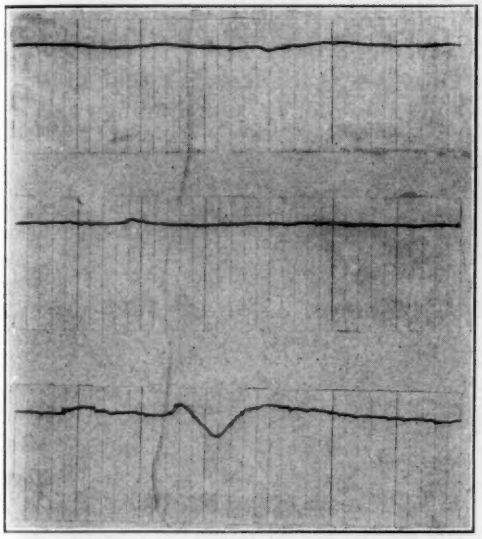


Chart 3. — Upper portion of trapezius; action on scapula; lying on right side. *Top curve,* abduction of left arm. *Middle curve,* hyperextension of left arm. *Bottom curve,* forward flexion of left arm.

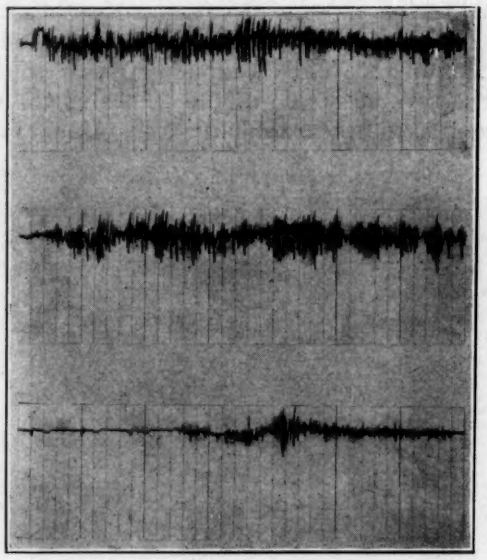


Chart 4. — Middle portion of trapezius; action on scapula; sitting position. *Top curve,* forward flexion of arm. *Middle curve,* abduction of arm. *Bottom curve,* adduction of shoulders.

   7. On forward flexion, moderately strong potentials were recorded (chart 4).
   8. On abduction, moderately strong potentials were recorded (chart 4).
   9. On abduction (retraction) of the shoulders, moderately strong potentials were recorded (chart 4).

B. Prone.
   1. On extension of the neck, no potentials were recorded.

C. Prone with left arm hanging over edge of table; electrodes over left trapezius; movement of the left arm.
   1. On forward flexion of the arm, strong action potentials were recorded.
   2. On abduction of the arm, strong action potentials were recorded.
   3. On extension of the arm, action potentials were recorded.

D. Lying on right side, moving left arm; electrodes over middle left portion of trapezius.
   1. On abduction of the arm, moderate action potentials were recorded.
   2. On hyperextension of the arm, sporadic potentials were recorded (chart 5).
   3. On forward flexion, moderate potentials were recorded (chart 5).

III. Lower Trapezius.

A. Vertical position.
   1. On extension of the neck, no action potentials were recorded.
   2. On depressing shoulders, strong action potentials were recorded.
   3. On elevation of shoulders, findings not consistent.
   4. On adduction (retraction), strong potentials were recorded.

B. Lying on right side; moving left arm; electrode over left trapezius.
   1. On abduction of left arm, moderate potentials were recorded (chart 6).
   2. On forward flexion of left arm, moderately strong potentials were recorded (chart 6).

3. On adduction (retraction) of shoulders, weak to moderate potentials were recorded.
4. On elevation of shoulder, moderate potentials were recorded.
5. On depression of shoulder, moderate potentials were recorded.

Comment

Upon reviewing the literature, one finds agreement as to the action of the trapezius as an elevator, adductor and depressor of the scapula. The trapezius has been described as a head rotator and a prime neck extensor. Smout and McDowall[3] stated that these movements may be performed by the reverse action of the trapezius. This view is at variance with that presented in other standard texts of anatomy and kinesiology. Our findings are

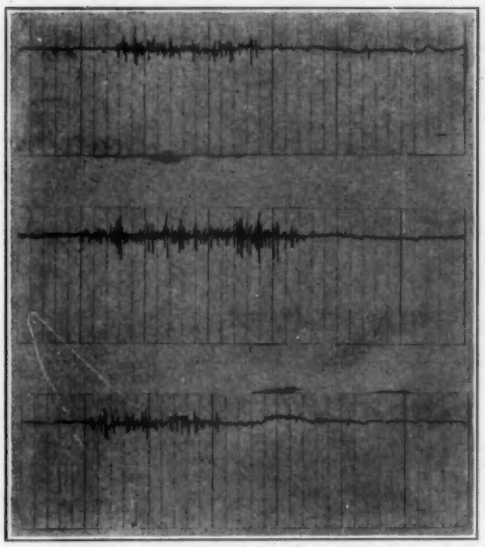


Chart 5. — Middle portion of trapezius; action on scapula; subject lying on right side. *Top curve,* abduction of left arm. *Middle curve,* hyperextension of left arm. *Bottom curve,* forward flexion of left arm.

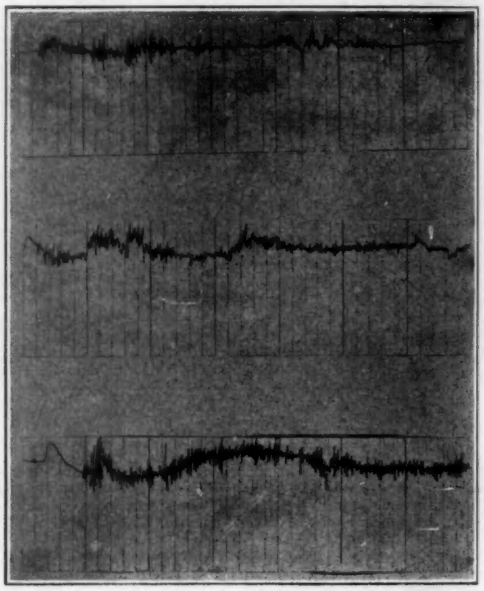


Chart 6. — Lower portion of trapezius; action on scapula; subject lying on right side. *Top curve,* abduction of left arm. *Middle curve,* forward flexion of left arm. *Bottom curve,* adduction of shoulders.

in agreement with those of others that the trapezius elevates, adducts and depresses the scapula. Elevation is performed by the upper and middle fibers, adduction by the upper, middle and lower fibers, and depression by the lower fibers. We occasionally observed the production of a potential on extension of the neck and rotation of the head when these movements were performed against strong resistance. Potentials occurred in only 2 subjects when these motions were not resisted. It would appear therefore that the upper part of the trapezius may act as an accessory muscle in movements of the neck.

Foerster[4] and Inman[2b] stated that the trapezius is a scapular rotator. According to Inman, during the first 40 degrees of abduction and the first 60 degrees of forward flexion, the scapula may be fixed, may move laterally, may move medially or may oscillate, depending on the habitual position at rest. The ratio of scapula to humerus remains constant, and for every 15 degrees of motion in the act of elevating the arm 10 degrees occurs in the

3. Smout, C. F. V., and McDowall, R. C. S.: **Anatomy and Physiology for Students of Physiotherapy,** Baltimore, Williams & Wilkins Co., 1947.
4. Foerster, O.; Bumke, O., and Foerster, O.: In Handbuch Der Neurologie, vol. 3, Berlin, Julius Springer, 1937.

scapula and 5 degrees in the humerus. Our findings are essentially in accord with these. We found that action potentials occurred between 15 and 60 degrees of abduction and 5 and 70 degrees of forward flexion while the subject was in the erect position. There was no constancy in the findings in different subjects. We were forced to conclude that postural influences play a determining role. This conclusion is further substantiated by the fact that activity is reduced when the subject is in the horizontal position.

The load represented by the weight of the structures of the shoulder girdle is greatest in the erect position whether the subject is sitting or standing and is less in the horizontal position. It is least when the subject is on his side. The performance of abduction and forward flexion while the subject is erect yields moderate potentials in the upper portion of the trapezius. However, if the subject lies on his right side and moves the left arm through these motions, no potentials are obtained. Recordings taken from the middle and lower portions of the trapezius when the subject is in the erect and in the lying position reveal greater potentials on the performance of these motions. Foerster[4] stated that the lower portion of the trapezius is an accessory to the serratus during the rotation of the scapula. The middle and lower portions of the trapezius hold the vertebral margin and the inferior angle of the scapula against the thorax.

Conclusions

Investigation of the trapezius muscle by electromyography reveals the following facts: 1. All three parts of the trapezius play a part in adduction of the scapula. 2. The upper portion of the trapezius elevates the shoulder; the middle portion also does so, but to a lesser extent. 3. The middle and lower portions of the trapezius are important accessory muscles in scapular rotation. They begin to function before 90 degrees of abduction or forward flexion is reached. In the erect position, the upper portion of the trapezius also acts as a scapular rotator. 4. The trapezius does not appear to be a prime extensor of the neck or a rotator of the head. It may act as an accessory muscle in these motions.

AMERICAN BOARD OF PHYSICAL MEDICINE

Examinations for certification to the board of physical medicine will be held in Atlantic City, two days prior to the annual AMA meeting, June, 1949. Applications must be on file ninety days in advance. The actual location for the examinations will be announced at a later date. All applications or inquiries should be directed to the Secretary, Dr. Robert L. Bennett, 30 North Michigan Avenue Chicago 2, Illinois.

MEDICAL NEWS

American Congress of Physical Medicine Officers, 1949

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Vice-President—**Frances A. Hellebrandt, M.D.**, Richmond, Va.

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Membership Committee — **Robert L. Bennett, M.D.**, Warm Springs, Ga., Chairman; **Walter S. McClellan, M.D.**, Saratoga Springs, N. Y.; **Milton G. Schmitt, M.D.**, Chicago; **Frank H. Ewerhardt, M.D.**, St. Louis, Mo., and **William D. Paul, M.D.**, Iowa City, Iowa.

Program Committee — **Arthur L. Watkins, M.D.**, Chairman, Boston, Mass.; **Gordon M. Martin, M.D.**, Rochester, Minn., and **Ben L. Boynton, M.D.**, Dallas, Texas.

Other Officers Named for 1949

Dr. Frank H. Krusen of Rochester, Minn., was elected to succeed himself to serve a term of three years on the financial committee of the American Congress of Physical Medicine.

Dr. Jessie Wright of Pittsburgh, Pa., was appointed to succeed herself to serve a term of seven years on the Board of the American Registry of Physical Therapy Technicians.

Dr. Earl C. Elkins was appointed to succeed himself for a term of six years on the Editorial Board of the **Archives of Physical Medicine.**

Dr. Gamble Appointed Head of Department of Physical Medicine

Dr. Shelby G. Gamble has been appointed head of the Department of Physical Medicine at the Cleveland Clinic. For the past three years Dr. Gamble has been assistant professor in the Department of Medicine at Ohio State University College of Medicine. During the same period he has been director of the Department of Physical Medicine at both University and Children's Hospitals in Columbus. For the past year he has also served as medical director of the Franklin County Cerebral Palsy Treatment Center and consultant in physical medicine at Nightingale Cottage.

Born at Pollock, Missouri, Dr. Gamble graduated from the Municipal University of Omaha, Nebraska, in 1932 and received his M.D. degree at the University of Nebraska College of Medicine in 1937. After his internship at Immanual Hospital at Omaha, he was a resident physician at Michigan State Sanatorium, Howell, Michigan, for two years. He was at the Cleveland Clinic in 1942 as a Fellow and in 1944 was appointed staff assistant in the Department of Physical Medicine. He was certified by the American Board of Physical Medicine in June of this year.

Dr. Gamble is a member of the American Medical Association, Ohio State Medical Society, Columbus Academy of Medicine, American Congress of Physical Medicine, American Society of Physical Medicine, American Rheumatism Association, and Michigan Trudeau Society, and has made numerous contributions to the medical literature.

Norman Titus Makes Change

Dr. Norman E. Titus, who has been in the VA, since 1944, announces his resignation, effective as of October 1. Dr. Titus has been keenly interested in the development of the Rehabilitation program as a part of Physical Medicine service in the VA. Until further notice Dr. Titus will live in Downingtown, Pa.

Dr. Mauriello Opens Clinic

Dr. N. Mauriello, Medical Director, announces the opening of the Wilkes-Barre Clinic of Physical Medicine and Rehabilitation, providing a physical and medicine rehabilitation service available as an adjunct to medicine, surgery and neuropsychiatry.

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ARCHIVES of PHYSICAL MEDICINE

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL MEDICINE

.·. EDITORIALS .·.

NOTICE TO CONGRESS MEMBERS

Please take notice that at the last annual business meeting of the Congress, Sept. 8, 1948, in Washington, D. C., Section 3, Chapter 1, "Dues and Assessments" of the By-Laws was amended and, in part, reads as follows: "Membership dues in the Congress shall be payable January 1 annually and shall be in such sum as the Board of Governors shall determine, provided that notice of the Board's determination of dues for the ensuing year shall be published in either the October or November issue of the ARCHIVES OF PHYSICAL MEDICINE. The dues so determined by the Board shall be net dues accruing to the Congress and shall be transmitted to the Congress regardless of the amount of dues that may be collected by a society affiliated with the Congress in accordance with any arrangement that may be entered into between the Congress and the affiliated society for the collection and transmission of dues."

In accordance with this amendment the Board of Governors set the amount of such dues for 1949 as Fifteen Dollars ($15.00).

THE TWENTY-SIXTH ANNUAL SESSION OF THE AMERICAN CONGRESS OF PHYSICAL MEDICINE

The American Congress of Physical Medicine held its first session of the second quarter century of its existence in the nation's beautiful capital city from Sept. 7 to 11, 1948. The spacious, cool and comfortable meeting rooms of the new Statler Hotel provided a fitting setting.

The main scientific program was carried on every afternoon in general sessions on topics of predominantly general interest, while in the forenoon the presentations were given in two parallel sessions. In one session, sponsored by the American Society of Physical Medicine, papers chiefly concerning fundamental research were presented; in the other, more general topics and procedures. There were several studies on the heating effect of microwaves, on iontophoresis, on electromyography, on ultrasound, on the effects of physical agents on circulation, on the effects of exercise and on the various aspects of medical rehabilitation. A symposium on poliomyelitis and a panel discussion on cerebral palsy were held. Many of these presentations were of extreme interest, and it would be difficult to single out any one in particular; it is unquestionable, however, that the well integrated research group of the Mayo Clinic led off in the number of excellent studies presented. All these presentations are scheduled for early publication in the ARCHIVES.

The Annual Instruction Seminar was also given during the entire session; here, again, there was a division of topics: One set of lectures, based primarily on physics and physiology was given for physicians only, the other presenting more general and clinical subjects for both physicians and technicians. There was a capacity attendance at both of these sections.

At the formal opening session addresses of welcome were given by the deans of the two medical schools in Washington, D. C., and the ranking

officers of the Army, Navy, Veterans Administration and the U. S. Public Health Service; a number of these addresses appear in this issue of the ARCHIVES. Dr. H. Worley Kendell, of Chicago, President of the Congress, acted as Chairman and inaugurated the incoming President, Dr. O. Leonard Huddleston, of Los Angeles, whose inspiring address on "New Horizons and Current Problems in Physical Medicine" also appears in this tissue. The new president acted as toastmaster at the Annual Congress Dinner, held on the subsequent evening, which was also attended by a large crowd; its chief event was a learned address of eloquent sincerity by our popular British visiting clinician, Dr. James Mennell, of London and lately of Los Angeles. Letters of greeting from our sister organizations abroad, the British Association of Physical Medicine and the Section on Physical Medicine of the Royal Society of Medicine were read by the Secretary, Dr. Richard Kovacs, and were received with spirited applause, as were the words of acknowledgment of Drs. Kiernander and Shulman, British delegates, when asked to rise. After the presentation of the "gavel" of the Congress by the new President to the retiring one, as a token of appreciation, for his labors, the awards of Gold Keys were announced by Dr. William Schmidt, of Philadelphia, and those of the scientific exhibits by Dr. A. B. C. Knudson, of Washington, D. C. The citations and a list of those honored appear in this issue. The entertainment was chiefly informal, singing led by Dr. Ben Boynton and assisted by Mrs. H. A. Carter and Dr. F. T. Jung at two pianos.

At the business sessions of the Congress, the reports of committees were read and discussed and important decisions as to policies were taken. The efficient and inspired work of Dr. Walter J. Zeiter, as Executive Director, and Miss Marion G. Smith, as Executive Secretary, received enthusiastic acclaim. Meeting places were voted upon for the next three years: 1949, Cincinnati; 1950, Boston, and 1951, California. The list of officers elected appears also in this issue.

Among other meetings held in conjunction with the Congress were the annual meeting and dinner of the Society of Physical Medicine, the annual meeting and luncheon of the Consultants on Education of the Council on Physical Medicine of the American Medical Association, the meeting and luncheon of the American Registry of Physical Therapy Technicians, the annual meeting and luncheon of the Study Group on Hydrology and Balneotherapy, a luncheon and round table of the Baruch Fellows and finally a set of Educational Conferences. All these meetings are an indication of the broadening scope of these activities within the purview of the Congress of Physical Medicine and of the readiness of able groups to assume responsibility for these. Under the stimulus of the new President's suggestion, a woman's committee by the wives of physicians is in progress, to enhance sociability at future meetings.

No examinations for the Board of Physical Medicine were held, the next meeting of the Board being planned for June, 1949.

The scientific exhibits, amounting to the number of 21, were excellently planned and displayed, many of them consisting of actual demonstrations; consequently they were studied by many eager groups. The technical exhibits, numbering 25, were of a wide variety, although the number of new types of apparatus exhibited was comparatively small. The standardized forms of apparatus and the other displays received constant attention, not only by members of the Congress but also by a large number of visiting physicians and technicians.

The 1948 Annual Session of the American Congress of Physical Medicine may be considered a huge success from every standpoint. Its distinguishing marks were the enthusiasm and cordiality of the large attendance and the

orderliness, dignity and scientific attitude prevailing at all proceedings. These features served as an inspiring demonstration that the clinical, research and technical groups in the constantly expanding field of Physical Medicine are united in their efforts to carry forward the banner of physical medicine and medical rehabilitation with only one object in mind — to serve the best interests of the vast number of the sick and disabled in all walks of life, in private practice, in institutional work and in the governmental services. May this missionary spirit prevail for many years to come. R. K.

COOPERATIVE RESEARCH

The program of the American Congress of Physical Medicine this year, as indicated by Dr. Kovács in the previous editorial, contained numerous reports of laboratory and clinical research. Such work is essential to scientific progress in any branch of medicine. To those, who have attended the annual meetings of the Congress over a period of fifteen or twenty years, it has been a gratifying experience to observe the advancement in this field as indicated by the constantly increasing emphasis on well controlled laboratory and clinical research.

Some of the reports at the recent Congress represented cooperative studies by the departments of physical medicine with other departments in the medical schools. Such cooperation is extremely desirable and ultimately essential if physical medicine is to make its maximum contribution to the medical and surgical specialties. This appears to the writer to be a logical step in the further advance of physical medicine. Well conceived and well planned cooperative research projects will undoubtedly appeal to investigators in the other specialties.

Although there is still room for much progress, the value of certain of the physical procedures in orthopedics, neurology, psychiatry, gynecology, urology and dermatology is well recognized. Their place in internal medicine, with the exception of their use in the rheumatic diseases, the peripheral vascular diseases, and poliomyelitis, is not so clearly established. The same may be said for general surgery, although a beginning has been made in this specialty by the use of early post-operative ambulation, ultraviolet irradiation of the air in the operating room, and the occasional use of the cutting current. Nevertheless, there are doubtless other important contributions which do not yet appear. There is also room for further study of the use of the physical measures in otolaryngology and ophthalmology.

The field for investigation in physical medicine appears to be limitless, especially when its relationship to the other specialties is considered. Well balanced enthusiasm, careful scientific study, time and research funds are the necessary elements for progress in this domain.

AWARDS OF MERIT BY THE AMERICAN CONGRESS OF PHYSICAL MEDICINE FOR THE YEAR 1948

In recognition of distinguished contributions to the medical science of physical medicine the Gold Key award was made to the following:

FRANK HENRY EWERHARDT, distinguished son of Missouri, in recognition of his contributions to the advancement of the science and art of physical medicine and particularly as a pioneer who has been an inspiration and guide to the workers in this field.

RICHARD KOVACS, distinguished son of New York, in recognition of his contributions to the advancement of the science and art of physical medicine as a writer of outstanding distinction and particularly as Editor of the Year Book of Physical Medicine.

AWARDS TO SCIENTIFIC EXHIBITORS

The Committee on Awards for Scientific Exhibits presented through its Chairman, Dr. Karl Harpuder, the following awards:

Silver Medal to Robert L. Bennett, M.D., and C. E. Irwin, M.D., for their exhibit "Poliomyelitis Care Throughout All Stages.

Honorable Mention to O. Leonard Huddleston, M.D., and James G. Golseth, M.D., for their exhibit "Clinical Electromyography."

Honorable Mention to A. Ray Dawson, M.D., and Mrs. Florence Linduff for their exhibit "Physical Medicine Rehabilitation in Tuberculosis and Thoracic Surgery."

ADDRESSES OF WELCOME
ANNUAL CONGRESS SESSION, 1948

Address of Walter Bloedorn, M.D., Dean, George Washington School of Medicine.

Thank you for the privilege of meeting with your distinguished group and for the opportunity of saying a few words at the Twenty-Sixth Annual Session of the American Congress of Physical Medicine. We are indeed honored that you chose the capital of the nation for your meeting.

Let me congratulate you on the newly created Board of Physical Medicine and the splendid work you are doing in insuring a sound program of training of personnel for this important specialty. There is an increasing need for adequate care of our physically handicapped. Your organization is meeting this need by fostering a continuous expansion of physical medicine and rehabilitation facilities throughout the country.

Medical educators are becoming more acutely aware of this need, and medical schools are beginning to recognize their responsibility in offering a better training program for both undergraduate and graduate students.

Our Department of Physical Medicine at the George Washington University Hospital has added something new in service to the community. It is filling a long-felt need for this type of service in a general hospital and has quickly made itself an indispensable service for good.

May I extend to you hearty greetings from the George Washington University School of Medicine and best wishes for your continued success.

Address of Leonard A. Scheele, Surgeon General, U. S. Public Health Service.

Even though I am making an unscheduled appearance, I am very happy to be here. I appreciate the courtesy that has been shown the Public Health Service by inviting me to be with you this evening. It is a great pleasure to welcome to the Nation's Capital the Twenty-Sixth Annual Session of the American Congress of Physical Medicine. I assure you that the Public Health Service and our parent organization, the Federal Security Agency, will follow with keen interest the sessions you have planned for the next four days.

Physical medicine is a growing and increasingly valuable specialty. It is an important element in several programs of the Federal Security Agency: in the hospitals and clinics of the Public Health Service; in the Office of Vocational Rehabilitation, and in the crippled children's program of the Children's Bureau. Moreover, the future development of programs for the control of chronic diseases undoubtedly will make new demands upon the specialist in physical medicine.

The growing interest in physical medicine has been stimulated by the results of anatomic and physiologic reconstruction, and especially by the benefits of functional rehabilitation. The real contribution of physical medicine and rehabilitation is a more satisfying and rewarding life for severely handicapped men, women and children.

I am sure that therapy is accepted with even greater enthusiasm when a man realizes that it is not only a medical procedure but the first step to a paying job. In our own medical and hospital care programs, for example, Dr. A. William Reggio, Officer-in-Charge of Physical Medicine and Rehabilitaiion in our Marine Hospitals, has an interesting program in that he actually sent occupational therapists to sea on vessels of the Merchant Marine and the Coast Guard. In a short voyage, these therapists make "job analyses" of the work performed by the crews and thus are able to take back to our hospitals and clinics, a better understanding of what disabled seamen and coast guardsmen will need to restore them more speedily to their particular jobs. The result is a kind of therapy based upon the vocational needs of the rigger, the quartermaster and the fireman. Similar analyses are made in arsenals and navy yards in order that our beneficiaries who are employed in these governmental industries may receive the best care we can possibly give.

I am sure that Dr. Reggio will forgive me for calling attention to the interesting and productive program which he is developing in the Public Health Service. One of its important results is that we have adopted the policy of helping medical officers who are interested in this essential branch of medicine to obtain the training they need.

Besides the work we are doing in our own hospitals and clinics, four other officers of the Public Health Service, under the direction of Dr. Thomas B. McKneely, are providing medical guidance and consultation to the Office of Vocational Rehabilitation, and through it, to eighty-seven cooperating State agencies for civilian rehabilitation.

These agencies, with Federal assistance, are providing a full range of rehabilitation services. Everything necessary to restore disabled persons to satisfactory employment is made available. The medical work in this program is done by skilled private physicians, qualified under the standards of the American specialty boards.

The state programs of vocational rehabilitation are integrated with services for crippled children. Each state has an agency for crippled children, which also receives federal assistance through grants-in-aid administered by the Children's Bureau. The state agencies provide treatment and care for as many children as they can serve with the funds at their disposal. Physical medicine is made available, as a part of the total program, and some of the members of your Congress are giving valuable assistance in this work.

Many of the states, however, find it difficult to obtain consultants in physical medicine. The problems of crippled children, of course, are often quite different from those of disabled adults, and the number of physiatrists who specialize in children's work is small indeed. Yet, in work with these young patients, physical medicine has its greatest opportunity for prevention and for successful correction of crippling conditions.

Help in meeting the costs of medical rehabilitation is only one of the services offered to disabled persons by the state programs for vocational rehabilitation. Vocational reconditioning is equally important and should proceed concurrently with physical medicine. Both should be initiated as soon as possible after the onset of disability. Vocational training — under medical guidance — stimulates the early attainment of occupational skills. Indirectly, it helps the therapist to obtain better results, because the stimulus of learning improves the patient's mental attitude toward therapy.

The federal-state cooperative program administered by the Office of Vocational Rehabilitation is operated by State Boards of Vocational Education in every state. The administrators of the state programs are very eager to have the attending physician refer disabled persons to them in the early stages of disability. Without early referral by the physician or the hospital, the full range of special services — physical medicine, vocational counseling and reeducation — cannot be brought to bear upon the patient's problem in the period when a successful outcome is most promising.

It is disappointing to learn that less than 4 per cent of the disabled persons who applied for rehabilitation services in 1947 were referred by their physicians. I believe that this is due chiefly to lack of information on the program among the professions generally.

Certainly no group is so well qualified as the members of your organization to promote the modern concept of physical medicine and rehabilitation. The specialty you have chosen requires a high degree of educational skill and persuasion in your work with your patients. Exercised among your professional colleagues in general practice and other specialties, that same skill and persuasiveness will undoubtedly stimulate a wider acceptance of physical medicine and rehabilitation services. More disabled persons will have a chance to return to life.

Again let me extend a cordial welcome to this Congress. I hope that many of you will get to know Dr. Reggio, Dr. McKneely and their staffs. I am sure that they will welcome the opportunity of discussing mutual problems and will ably represent the Public Health Service. I hope that you will be able to say that the Twenty-Sixth Annual Session of the American Congress of Physical Medicine in Washington was the pleasantest and the most successful of all.

Address of Brigadier General John Hargreaves, U. S. A., Deputy, The Air Surgeon.

The neglected step-child has come into its own. Although one of the oldest forms of medicine practiced, dating back to the first poultice of mud and leaves applied to a strained paleolithic wrist, physical medicine is the latest orphan of medical practice to be adopted. The chance eavesdropper at the door of the hydrotherapy pavilion on Feb. 9, 1947, must have been startled, indeed, at the sound of cheers and loud cries that issued through the cracks. And more than one arthritic wrist must have screeched in protest at the enthusism with which "mild manipulation" was applied. The babe that had been consigned to the stable was brought into the palace and baptized, or if you prefer, circumcized, in the throne room. On that date, the Advisory Board for Medical Specialties of the American Medical Association voted to approve an American Board of Physical Medicine. The medical profession thus placed its official stamp of approval on the specialty of Physical Medicine.

Before World War II, physical medicine was in much the position of orthopedics before the first World War. Each was a neglected and unrecognized specialty. In each instance, when the opportunity to serve arose, the unwanted orphan disproved completely all insinuations as to the rachitic nature of its legs. Each demonstrated that it had a genuine contribution to offer which only physicians specially trained in the methods peculiar to the particular field were prepared to perform.

The practice of physical medicine, because it so commonly employs mysterious electric currents and waves of varying lengths and frequencies, was often placed in the hypo-stained hands of the radiologist who was supposed to "know all about such things." He may or he may not have, but, at any rate, physical medicine did not occupy the coziest corner of his heart. Frequently, it was the orthopedist who had the thistle of physical medicine dropped inside his underwear. He knew all

about muscle insertions and which bones had trochanters and which had condyles, but he was more interested in the question of whether to wire or pin that last fracture than whether infrared or short wave therapy would be more efficacious for the treatment of the fibrositis before him. And though many a radiologist and orthopedist did a creditable job, his knowledge of the range of therapeutic measures available was usually limited.

During the war, however, the picture altered considerably. With thousands of patients being admitted to the large service hospitals daily, it became apparent that the orthopedists and radiologists did not have the time to follow a patient through the critical convalescent period that so frequently determined whether he would be a lifelong invalid or a useful member of society. That they did not have the specialized training or interest in physical medicine was already known. Thus, the exigencies of tremendous numbers of patients whose lives could be so drastically altered, combined with the need for additional physicians to relieve the other specialists of some of their duties, fostered the development of physical medicine in the armed forces.

Reconditioning was one aspect of the hospital program to which the practitioners of physical medicine made such a ponderous contribution. The employment of physical measures in therapy was another. The scientific application of measures at the disposal of the physician, by a physician whose main professional interest and, consequently, his investigation and experience were directed toward that end, gave us amazing results.

Physical medicine has placed us greatly in its debt. I am happy to have had the opportunity to thank each of you for your share in making it the sound scientific medical specialty that it is.

Address of Arden Freer, M.D., Acting Chief Medical Director, Veterans Administration.

It is a pleasure to join you for the Twenty-Sixth Annual Session of the American Congress of Physical Medicine and to share with you the privilege of planning for the growing responsibilities in this specialty. As you doubtless are aware, the Veterans Administration has a very real and vital interest in the operation of an effective and modern physical medicine rehabilitation service in its 126 hospitals and 70 clinics. With more than 100,000 patients under the care of the Department of Medicine and Surgery, embracing most of the diagnostic groups known to the physician, we face daily an urgent need for every facility which physical medicine can provide in overcoming the diseases, injuries and disabilities occurring among the veteran population.

In addition to the formidable size and scope of the veteran patient load, we are faced with another aspect which is more or less peculiar to the Veterans Administration. I refer to the fact that our patients, as a rather fixed group, are constantly growing older without a proportionate number of younger patients being added. At the present time, a high percentage of patients in Veterans Hospitals are in advanced age groups. For example, the average World War II veteran is approximately 30 years of age. The average age for World War I veteran is about 55. With each passing year, the problem of chronic illness will increase, both because of this rigidity of patient population and because the average life expectancy in this country is slowly but steadily increasing. The Federal Board of Hospitalization has conducted a number of interesting and informative studies relative to future work loads in veterans' medical care. In one such study, it was shown that in 1940 there were 4,086,000 living veterans of World War I, with 16,000 of them being cared for as general medical and surgical patients. In 1980, according to the acturial tables, only 9 per cent of these four million veterans will remain but our general medical and surgical patient load from this group will have doubled. Obviously, then, we must recognize that the shrinking of the veteran population in coming years will not lighten our medical load; rather, there will be an increasing number of these veterans who will be in need of medical care. To meet this problem of chronic disease in an aging veteran population, we must be prepared adequately with all the skill and resources which the entire medical profession can provide.

I bring this to your attention with the sincere hope that, through your professional organization, you will assist the Veterans Administration in planning a definite program to meet this challenge. Obviously a solution to the problem of the chronically ill patient will demand the best efforts of every medical specialty group. At the same time, a substantial part of the problem rests upon your shoulders.

In the past, the Department of Medicine and Surgery has counted upon its doctors of physical medicine to assume a large portion of the responsibility for adequate care and treatment of our patients and for many answers in dealing with the problems of the severely disabled. It has been my pleasure to see these physicians respond admirably to the challenge which our millions of veterans have posed. I am confident that we will continue to receive from them, and from the Congress of Physical Medicine, the same invaluable cooperation and endeavor which have contributed so materially to a constantly improving medical service for veterans.

Address of Rear Admiral H. L. Pugh (MC) U. S. Deputy and Assistant Chief of the Bureau of Medicine and Surgery.

On behalf of the Surgeon General of the Navy, it is a pleasant privilege for me to welcome the members of the Congress on Physical Medicine to Washington, on this, the occasion of your annual session. I want to bring to you greetings from Admiral Swanson and to express his regret that a mission in the Pacific in connection with official duties prevents his presence here. Speaking for the Chief of the Bureau of Medicine and Surgery, I want to assure you that it has been the wholehearted desire of the administrative heads of the Medical Department of the Navy to take advantage of every opportunity to encourage

a closer relationship between that department and the various components of civilian medicine. My Bureau of the Navy recognizes the need for frequent consultations and exchange of ideas with our civilian colleagues in the interest of maintaining the highest possible professional standards and readiness for emergencies in the Navy Medical Corps. This is a most important function of the office of the Surgeon General.

The maintenance of a state of physical readiness of all personnel in the Navy and Marine Corps is of paramount importance. This fact has been no more cogently expressed, I think, than by Disraeli when he observed that the health of a people is really the foundation upon which not only all their happiness but all their powers as a state depends. Aside from the maintenance of health of our present day military and naval personnel, we are still, three years after the termination of the late war, confronted with the matter of the salvage of human wreckage, the restoration of function to crippled limbs and bodies incident to the ravages of war. As a natural and inevitable aftermath of any war, rehabilitation of warriors becomes intensely important and poses a live challenge and a weighty responsibility to both the civil and the military agencies of a nation.

That this responsibility would come to the forefront and assume a greater magnitude as the war progressed was foreseen many months prior to VE and VJ days. In order that the Navy might fulfil its mission and obligation to its war veterans, a definitely purposeful rehabilitation program was inaugurated at the instance of the Surgeon General early in the war and was developed as the war wore on. Then too, in May, 1944, the first meeting of the Scientific Advisory Council of the Baruch Committee on Physical Medicine was held. This, of course, added an especial impetus to the movement as a whole.

There are several aspects to rehabilitation: social, economic and physical. The aspect with which the medical profession and its auxiliary forces are primarily concerned is the physical one — hence physical medicine. I think, moreover, it will be generally agreed that hand in glove with physical rehabilitation goes psychologic rehabilitation. In fact, the success of either is dependent upon the other.

We have for long had physical medicine in one form or another. Albeit, certain of its concepts have, in some quarters, been so poorly applied in the past as to amount to little more than hocus pocus. Properly supervised and administered, physical medicine is undoubtedly founded upon as sound a basis as any form of therapy. In fact, more hocus pocus has been, and will, no doubt, for some time, continue to be dispensed in the form of pills, elixirs and shots than by the common sense principles of physical medicine. There is, I think, no more impressive evidence of what may be accomplished by experts in physical and psychologic rehabilitation than one sees in a facility devoted to the care of paraplegics. The new concept with respect to persons with paraplegia and what can be done for them, is to me one of the truly amazing advances that has come out of the late war. The National Paraplegics Foundation is, I believe, the chief standard bearer in this crusade or endeavor in behalf of the paraplegics.

Aside from what can be accomplished therapeutically through the measures and devices of physical medicine, I am keenly appreciative of another extremely important role which can be played by these agencies in the nature of a prophylactic against "hospitalitis." Long ago I came to recognize the reality and the pernicious character of this malady.

On March 1, 1945, a new department, that of Physical Medicine, was opened in the Naval Medical School, Bethesda, Md., for the purpose of training enlisted technicians. Sixty-seven men were ordered to the first class. The course extends over a period of five months and comprises 800 hours. We have trained in this school so far 142 corpsmen. In addition to these technicians in physical medicine, we have sent 36 nurses through a course at the Medical College of Virginia, at Richmond. Ten are in training there at present. Three medical officers have received training under Dr. Krusen at the Mayo Clinic, and one is under training there at present.

I had hoped, along with a number of others, that physical medicine would, under the impetus afforded by World War II, be accorded its rightful place in the major league of medical specialties, much as was the case with orthopedic surgery during and after World War I. That this hope has been realized is indicated by the creation during the past year of an American Board of Physical Medicine. I hope and believe that the specialty has become established on a sane, respectable, useful and lasting basis in the Medical Corps of the Navy.

Physical Medicine is singularly interesting to me right at present on two counts. In the first instance it is interesting because practically all my life I have been some sort of a disciple of that school whose doctrine it is that the human machine is more prone to rust out than to wear out. In fact, I am probably considered by some as something of a crank on the subject of exercise, and among those who look askance upon my precepts and practices are my wife and son. This is particularly true on Sunday mornings when I disturb their slumber and the aplomb of the pictures on the wall and so forth by tumbling on the front room rug. This sort of thing becomes something of an obsession with one — like lifting the bull — and I have at times wondered how likely one is to take an overdose of this physical medicine. What is the margin of safety? It would be quite embarrassing for me to find myself in a predicament similar to that of the man who took an overdose of rejuvenating medicine and his wife had to push him around in a baby carriage. So what I want to know is when it comes to the matter of calisthenics, what is the limit to which we veterans of the first World War or the Spanish-American War can go. Specifically, is one more apt to have a cerebral hemorrhage if he is standing on his head than on his feet? How likely are these various

pretzel bends to cause an aneurysm of the aorta or a rupture of the diaphragm? There are a few of us old die-hards who may be looking for a good excuse to let up on some of our self-inflicted corporal punishment. Now the second reason for my particular interest in physical medicine at this time ties in with the fact that I have just recently made the front pages of the Washington newspapers — a distinction devoutly to be shunned — as one member of a two man crusade (the other member being a line Admiral), which, according to the newspapers at least, proposes to spark plug a movement to bring Naval officers into a sharper state of physical fitness — the idea and our keynote being that a man is never down at the mouth if he is up on his toes.

So you see it is all the more important that I know the answers to the questions I've just raised —I don't want to be responsible for an epidemic of cerebral accidents among the Admirals as a result of my having inadvisedly advocated that they stand on their heads — I might be suspected of being in collusion with the junior officers in a campaign to creat vacancies in the upper echelons and thereby enhance their chances of promotion. Moreover, since I am saddled with the inevitable burden of producing a tome embodying the most modern concept on "how to keep fit and like it," or "eating your way to health," I would like to enlist the aid of organized Physical Medicine in this endeavor.

In conclusion, I wish to express the Navy's appreciation and gratitude to the American Congress of Physical Medicine, to the American Physiotherapy Association and to the American Occupational Therapy Association for the help and assistance they have so generously given to us at all times in developing our program. Their support has played no small part in helping to establish physical medicine on a high professional level in the Navy. To those who would be interested in seeing our physical medicine appurtenances at Bethesda, I want to extend to you a cordial invitation to go out there.

Again, I say I welcome you here. I wish to thank the chairman of your program committee for permitting me to speak to you. I hereby subscribe to you the support and cooperation of the Medical Department of the Navy in the further development and advancement of your important specialty.

Address of Brigadier General Silas H. Hays, U. S. A., Acting Surgeon General, U. S. Army.

General Bliss desired me to express the sincere appreciation of the Medical Department of the Army for the outstanding assistance given by many members of this organization in helping us to implement our relatively new Physical Medicine Service.

Physical medicine has been an important part of medical care in Army hospitals for over thirty years. Two years ago the decision was made to establish physical medicine as a major professional service in the larger Army hospitals. Despite difficult personnel shortages, this has been accomplished, and today we have what we believe to be as good physical medicine departments as exist anywhere.

There are ways in which the members of your organization have contributed to the successful establishment of the specialty of physical medicine in Army hospitals. When we started looking for Army physicians with training in physical medicine in the summer of 1946, it was found that only two medical officers with any training at all in this specialty were available. The problem of securing postgraduate training for our medical officers who elected to enter the specialty of physical medicine as a career was solved only through the wholehearted cooperation of such civilian medical institutions as Columbia University Medical School, the Mayo Foundation, the University of Southern California Medical School and others. During the past two years fourteen medical officers have received courses in physical medicine at such civilian institutions. In addition, this basic instruction has been supplemented by splendid clinical training in such institutions as Bellevue Hospital, New York Hospital and others.

Many of you are familiar with the consultant system now in effect in the Army. This system, whereby outstanding civilian doctors contribute their services in affording patients in Army hospitals the best medical care in the world, is one of the major advances ever made by the Medical Department of the Army. In the field of physical medicine, the Army is fortunate in having available as consultants twenty-one outstanding physiatrists (specialists in physical medicine).

At the present time, residencies in physical medicine are in operation at three Army general hospitals which are designated as teaching institutions. It is planned to extend the residency program in physical medicine to include two other general hospitals. In many specialties, and particularly in that of physical medicine, it would have been well nigh impossible to establish successfully our residency training programs without the tremendous help given to us by the expert civilian consultants.

During the past three months, two noteworthy events in the field of physical medicine and rehabilitation have taken place. One was the Inter-Service Conference on Physical Medicine and Rehabilitation held here in Washington, in which five of the government medical services took part. Participating in this meeting were specialists in physical medicine and rehabilitation from the Navy, the Army, the Air Force, the Veterans Administration and the Public Health Service, in conjunction with consultants for each service. It will interest you to know that recommendations have been made that this interservice conference meet each four months hereafter. The other event which was of far reaching significance was the First Inter-American Conference on Rehabilitation, held in Mexico City during July. Physicians, surgeons and lay rehabilitation experts from nineteen countries of North and South America took part. It is obvious that when interest in a particular field of professional endeavor warrants such unusual collaboration much good will ensue.

Many of you who are here this evening served with distinction in the Medical Corps of the Army during the recent war. Your incoming president, Dr. Huddleston, performed exemplary service as Chief of Physical Medicine at Fitzsimons General Hospital, and his outstanding work while there on physical medicine as applied to thoracic surgery is well known to all.

Plans for utilization of specialists in case of future military emergencies will be of interest to you, particularly those who were in uniform during the period 1941 to 1946. Extensive studies have been under way to determine how best to utilize professional talent and to place specialists where they are most needed. A comprehensive plan has been evolved providing for the assignment of specialists only to medical units in which their services can be utilized to the fullest degree and they can be kept busy. There has been recently set up in the Office of the Surgeon General a new section which is engaged exclusively in organizing this new system and in cataloging all types of specialists. Those doctors who are or who may become reserve officers will be assured of being called only when there is need for the services of highly trained individuals in their particular field. This plan envisages a much wider and more comprehensive assignment and utilization of the specialist in physical medicine. In the larger overseas medical units and headquarters, physiatrists will be assigned along with other specialists. Of course, it is hoped that such plans for future military emergencies will not be needed, but, in case the necessity arises, it is believed that this new thinking will gravitate to the mutual advantage and satisfaction of the Medical Department and to the individual doctor.

The critical shortage of doctors in the armed forces is at present our greatest problem. Plans have been formulated and mechanisms are under way to relieve this acute shortage of doctors in the Army. All agencies, both civilian and governmental, have given splendid cooperation in the resolution of this formidable problem. Along with shortage in all categories, there exists a shortage of medical officers trained in physical medicine.

Two procedures in our personnel procurement plans are quite new and offer decided advantages to persons who are interested. Recent legislation now provides for commissioning in all grades up to and including that of colonel a certain number of board-certified specialists in all fields. Naturally, persons commissioned in the advanced grades will have to be well qualified and experienced, and assurance is given that they will be utilized in their respective specialties. A total of ten such vacancies for direct commission as colonel or lieutenant colonel in the Medical Corps of the Regular Army are available in the field of physical medicine, and doctors so appointed will find that the Medical Department of the Army offers a gratifying professional career.

Of equal importance is the civilian resident program now in effect. Under this program commissions will be tendered to 300 selected civilian physicians who have been accepted for residency or fellowship training or who are actually in such training in civilian hospitals approved by the American Medical Association. Physicians so commissioned will be permitted to remain in their training in these civilian institutions as officers on active duty, with full pay and allowances until they meet the formal training requirements in their respective specialties. Upon completion of this training they will be expected to serve one year on a duty status in an Army installation for each year of training received. For example, a physician who has just entered on a three-year residency or fellowship in an approved civilian institution may apply for enrollment in this program. If he is accepted, he is commissioned as a Regular Army medical officer and allowed to continue his residency or fellowship in the civilian institution where he is enrolled. During this entire period he receives full pay and allowances of a first lieutenant or captain in the Medical Corps, plus the additional $100.00 per month now authorized for doctors in the services. You can readily see that when his formal training is completed, the required year-for-year service which follows will give him credit for the limited-practice phase of his training required by the specialty board. In contrast to the $50 or $75 per month that the average young doctor has to exist on during residency or fellowship training, he will receive from $400 to $460 per month while obtaining the identical training. There has been a good response to this civilian residency program in practically all specialties. There is authorization for enrollment of ten physicians for training in the field of physical medicine, but at the present time not a single application has been received from residents or fellows in physical medicine. This has caused considerable concern in the Procurement Branch of the Personnel Division, and just last week one of the officers from this division made a special trip to one of the larger civilian medical centers to interview young physicians who are in training in physical medicine.

The Medical Department of the Army, in fulfilling its mission, considers the physiatrist an important and necessary part of the team which enables the American soldier to be given the best in modern medical care. Since the establishment last year of the American Board of Physical Medicine as the sixteenth specialty board, this field can now look forward to a period of unprecedented progress and development. In the Army we shall continue to depend on you who are the leaders in physical medicine in civilian circles to guide and assist us in our efforts.

The Medical Department of the Army extends to each and every one of you a most cordial welcome and desires to congratulate the American Congress of Physical Medicine on the occasion of its Twenty-Sixth Annual Scientific and Clinical Session.

Letters of Greeting

Letter from John Shulman, Hon. Secretary, Section of Physical Medicine, Royal Society of Medicine (London): The Council of the Section of Physical Medicine of the Royal Society of

Medicine would like to convey to the American Congress of Physical Medicine in Washington this cordial message of friendship and good will and to wish them every success in the very important work that they are contributing to the development of physical medicine.

They also would like to convey a special message of good will to Dr. Richard Kovács, Secretary of the American Congress of Physical Medicine.

Letter from Frank Howitt, Vice-President, British Association of Physical Medicine (London): When the Council of the British Association of Physical Medicine learned that Dr. Kiernander, one of its members, would be attending the American Congress of Physical Medicine, it resolved to ask him to convey to the Congress our Association's warmest wishes for a successful and fruitful meeting.

Medical News

(*Continued from page 652*)

National Health Assembly

The section on Physical Medicine and Rehabilitation of the National Health Assembly, recently held in Washington, D. C., made the following recommendations:

1. Rehabilitation should be broadly conceived; it should be available to the mentally and physically handicapped and should not be confined solely to the restoration of persons to employment but should be extended to include those who might achieve a more useful and purposeful life.

2. A program of federal assistance through grants-in-aid should be extended to (*a*) assist universities and colleges to develop and strengthen opportunities for the professional training of rehabilitation personnel; (*b*) assist each state to inventory their existing rehabilitation, physical medicine and workshop facilities, survey the need for the establishment of rehabilitation, physical medicine and workshop facilities and develop programs for the establishment of needed public and nonprofit facilities; assist States to provide a broader financial basis for the establishment and maintenance of needed rehabilitation, physical medicine and workshop facilities (federal financial assistance should be available not only to establish new facilities when needed, but also to enlarge or expand those few that now exist); assist universities, nonprofit research institutions, and governmental agencies to develop and encourage research in rehabilitation methods and technics and prosthetic devices as will contribute to the rehabilitation of all types of disabled persons, and assist each State to conduct a study to determine the size, nature and characteristics of its disabled population and determine those who need rehabilitation.

3. Educational standards for training and employment of rehabilitation personnel should be those of the professional groups concerned and the appropriate accrediting agencies.

4. A general program of education and information be carried on to encourage young persons to select some one of the professions in the field of physical medicine and rehabilitation.

5. Each child should receive adequate diagnosis, treatment and after-care in accordance with his rehabilitation needs, in order to insure him the opportunity for optimum development.

6. Public and private, national, state and local organizations and agencies engaged in various aspects of rehabilitation should exchange information, coordinate activities and work cooperatively to the end that the person who is disabled may receive the kind and quantity of attention, care and training necessary to rehabilitate him to the limit of his capacity.

7. A program of public education and information, including all mediums, should be developed to its fullest extent to educate workers and the general public with respect to what is being done and what should be done in the field of rehabilitation.

8. All hospitals should provide services of physical medicine.

9. All medical schools should include instruction in physical medicine.

10. The idea of isolated and fragmentary activity on behalf of the physically handicapped should be developed into a dynamic concept of integrated and continuous service.

Annual Convention

The 28th annual convention of the National Society for Crippled Children and Adults, Inc., will be held at the La Salle Hotel, Chicago, November 15-17.

Many outstanding speakers in the fields of medicine, health and education will be on hand to present facts on progress in work with the handicapped during the past year.

Physical Medicine at the New York Academy of Medicine Graduate Fortnight

Each fall the New York Academy of Medicine holds a Graduate Fortnight on some timely topic in medicine. This year's Fortnight, to be held from October 4 to 15 at the New York Academy of Medicine Building and at a number of hospitals, has as its subject "Advances in Therapy." Among the clinicians scheduled to speak is Dr. William Bierman, on "The Treatment of Bell's and Other Palsies" at the evening session of October 14; Dr. I. D. Stein, on "Rehabilitation of the

Chronically Ill, Including Home Care," at the afternoon session at Montefiore Hospital on October 13, and Dr. Richard Kovacs, on "Recent Advances in Physical Therapy," at the afternoon session at New York Polyclinic Hospital on October 15.

Women's Medical Specialist Corps Announces Revised Requirements for Commissions

Young women who seek an Army career as a dietitian, as a physical therapist, or as an occupational therapist, no longer face the requirement of prior military experience.

Appointment will be tendered to applicants who are under twenty-eight years of age at the time of commissioning, who are physically qualified for general duty and who have an unmarried status, with no dependent children under fourteen years of age. These young women will first be commissioned in the Reserve Corps and can make application for appointment in the Regular Army after a minimum term of six months on extended active duty.

Young women who wish to apply for a commission in the Reserve Corps should write to the Office of The Surgeon General, Department of the Army, Washington 25, D. C., Attention: Chief, Women's Medical Specialist Corps.

New York State Association for Crippled Children to Hold Conference

Outstanding authorities in the fields of rehabilitation and other allied activities in the statewide program for aiding the disabled, will speak and give demonstrations at the demonstration-conference sponsored by the New York State Association for Crippled Children at the Lenox Hill Hospital, New York City, November 4 and 5.

This conference, the first of its kind ever held in the State, will have as its theme, "Functioning Programs for the Disabled in New York State."

The first day will be devoted chiefly to addresses by State Health and Education officials and motion pictures on rehabilitation, amputations, cerebral palsy and poliomyelitis. Demonstrations on the second day will explain programs in various communities in which the New York State association is participating.

All physicians and others interested in rehabilitation and other assistance for the disabled are invited to attend. There will be no registration fees.

Illinois Commission for Handicapped Children

On October 1, 1948, the Fifth Governor's Conference on Exceptional Children was held on the Campus of Southern Illinois University at Carbondale.

Margaret B. Cowdin, Chief of the Division of Public Health Education, in the morning session, spoke on the usefu'ness and service of county health departments. Dr. Julius Richmond, Associate Professor of Pediatrics, University of Illinois College of Medicine, spoke on Child Development.

H. Worley Kendall, M.D., Chairman, Department of Physical Medicine, University of Illinois Hospitals, gave a talk on Physical Rehabilitation.

Study Sound at Wisconsin

It's doubtful that "looks can kill" but University of Wisconsin scientists know that certain sounds have interesting, often lethal effects — at least on bacterial and protozoa, very small one-celled plants and animals, some of which cause disease.

Sounds or "audible vibrations," to be specific, are being studied by Eugene Ackerman, research assistant to H. B. Wahlin, professor of physics, in an attempt to learn whether they can be useful in research on the chemistry and physics of tissue cells and bacteria.

Vibrations, Ackerman says, have one great advantage for biologic extraction purposes; they will break tissue up into its chemical "parts" without the use of heat which often destroys the very substances biochemists want to study.

They may, in addition, be used to break up cells of microorganisms to release heat-sensitive cellular enzymes, and he hopes that may even induce changes in heredity in certain forms of life by changing chromosome structure. Yeast and liver extracts can be manufactured without the use of heat.

The vibrations are produced by three devices designed by Ackerman. Two of the vibrators, which differ from one another only in size, are based on the same principle as a telephone receiver, each having a magnetic coil which causes vibration in a thin metal disk. The third vibrator has a plunger which can be lowered into a container of liquid.

When in operation they sound like a radio with a bad tube — but each can kill protozoa in small quantities of liquid within a matter of minutes. Bacteria are affected just as lethally, but it sometimes takes slightly longer.

The smallest vibrator will hold about a teaspoon of bacteria, mold spores, virus, liver, yeast, or what-have-you, in solution, and the larger will hold about a tablespoonful. The third device will induce vibrations in a test-tube full of liquid.

One practical use for the vibrators has been in the field of virus research. Scientists in the college of agriculture believe they may be helpful in learning the nature of two viruses with which they are working.

These viruses cause a disease in chicken embryos, and appear to be a mixture of two different kinds. It is hoped the selective action of the vibrators will destroy one virus to let scientists know which of the two cause disease, or if both play a part. The viruses can be seen only under the electron microscope.

Although vibrations have been used previously in some biologic research, Ackerman will study the effect on tissue and bacteria of vibrations over the whole audible range — from basso profundo to the highest soprano, to use an operatic analogy.

"No one to our knowledge has studied more

than one or two frequencies," Ackerman said. "I've been working on the development of magnetic vibrators with an adjustable pitch."

It is possible, scientists say, for particular frequencies to be more efficient in breaking up tissue, just as certain X-ray and ultraviolet light frequencies have advantages others do not.

Work has been done at other laboratories with super-sonic vibrations, which are above the frequencies audible by the human ear, but these have attendant heating capacities which often destroy their usefulness for biologic extraction purposes.

APMA Medical Section

Dr. Theodore Klumpp, President of the American Pharmaceutical Manufacturers' Association has announced that the following ten physicians will serve as the board of its recently created medical section: Dr. Charles E. Dutchess, Schenley Laboratories, Inc., New York City (Chairman); Dr. J. B. Rice, Winthrop-Stearns, Inc., New York City; Dr. Stanton M. Hardy, Lederle Laboratories, Division American Cynamid Co., Pearl River, N. Y.; Dr. D. K. Kitchen, Bristol Laboratories, Syracuse, N. Y.; Dr. Paul C. Barton, Brewer & Company, Inc., Worcester, Mass.; Dr. R. L. Conklin, Ames Company, Inc., Elkhart, Ind.; Dr. George Hazel, Abbott Laboratories, North Chicago, Ill.; Dr. Irwin C. Winter, G. D. Searle & Company, Chicago, Ill.; Dr. Paul Spickard, Rexall Drug Company, Los Angeles, Calif.; and Dr. John M. Shaul, Maltbie Chemical Company, Newark, N. J.

Trained Personnel Lacking in Occupational Therapy

At the present time many patients are unable to receive the benefits of occupational therapy because of the shortage of trained therapists. There are only 3,000 trained occupational therapists working in hospitals in this country. Another 2,000 positions exist, for which hospital administrators are unable to find trained personnel. In June of this year, for example, 209 additional occupational therapy positions were created in the twenty-six hospitals and schools operated by the New York State Department of Mental Hygiene. After three months difficulty is still being encountered in filling these positions.

This personnel problem, however, is slowly being solved. From 1918 to 1941 there were only five recognized schools of occupational therapy in the United States. Today, there are 25 here and one in Canada. Started during the war, these schools will continue to train occupational therapists so that the physically and mentally disabled civilian may have the full benefit of this war-born branch of medicine. — Rusk, N. Y. *Times*.

Course in Physical Medicine

The second three-month course of instruction in Physical Medicine and Rehabilitation is being given at the Veterans Administration Hospital, Hines, Illinois.

Nineteen physicians from various Veteran Administration hospitals throughout the country and one army physician, are enrolled in the course which started September 20, 1948 and continues until December 11, 1948.

This course is under the direction of Dr. Louis B. Newman, Chief of the Physical Medicine Rehabilitation Service at the Veterans Administration Hospital, Hines, Illinois, where Dr. K. A. Carroll is Manager.

Pennsylvania Academy of Physical Medicine Holds Meeting

At a regular monthly meeting of the Pennsylvania Academy of Physical Medicine, September 16, 1948 at the Philadelphia County building, a symposium on peripheral vascular disorders was presented by Dr. David W. Kramer who spoke on "Newer Trends in the Treatment of Peripheral Vascular Disorders," Dr. Edwin Mendelssohn on "The Role of the Surgeon in the Treatment of Peripheral Vascular Disorders" and Dr. Albert A. Martucci on "Physical Medicine and Rehabilitation in Peripheral Vascular Problems."

Sidney Jay Furst

It is with regret that we announce the death of Dr. Sidney Jay Furst of New York City. Dr. Furst, a pioneer in physical medicine was head of this department at the Morrisania Hospital.

Joseph Scattergood, Jr.

It is with regret that we announce the death of Dr. Joseph Scattergood, Jr., a member of the American Congress of Physical Medicine and a member of the Pennsylvania Academy of Physical Medicine.

BOOK REVIEWS

ADVANCES IN BIOLOGICAL AND MEDICAL PHYSICS. Volume I. Edited by *John H. Lawrence* and *Joseph G. Hamilton,* University of California, Berkeley, California. Cloth. Price, $8.60. Pp. 484 with 66 illustrations. Academic Press, Inc., 125 East 23d Street, New York 10, N. Y., 1948.

This first volume of an intended yearly series deals with progress in radiation research. This volume is of the highest possible standards and covers all work recently done in this rapidly developing field. Research workers in the field owe a vote of thanks to editors, authors and publishers for starting this timely series. Each of the articles comprising the book is written by a foremost expert in the field. Dougherty and Lawrence of the Donner Laboratory at Berkeley describe developments of isotope research in experimental medicine, Vennesland of the university of Chicago deals with nitrogen and carbon isotopes. An extremely useful article is that by Cohn on the nature and production of artificial radioactivity. Research workers will be particularly grateful for the chapter on availability of isotopes. Technical developments of instrumentation, all important in a relatively new field, have been ably discussed by Evans of M. I. T. L. Parker of the Swedish Hospital in Seattle discusses health aspects and radiation protection. There are four chapters dealing with what one might call biochemical data obtained with radioactive isotope research. Included is hemoglobin and the erythrocyte, phosphorus metabolism, iodine metabolism and nucleic acid metabolism. Some of the medical effects of atom bomb irradiation on the Japanese are discussed by Howland and Warren.

The reputation of the authors and the thoroughness of the presentation, together with excellent bibliographies make this book a must for workers in the field. An author and subject index covering the entire volume makes the book even more valuable as a reference book. It is to be hoped that the plan of publisher and editors to make this an annual series will become a reality. This reviewer would like to suggest that the title of this series be reconsidered. Biological and medical physics is a large field and radiation research is only a part of it. Such fields as membrane potentials, physiologic acoustics, physiologic optics and many other fields of biophysics have gone through considerable development in recent years. The complete identification of biological and medical physics with radiation and radioactive isotopes seem therefore a limitation which is not justified in view of these developments. Much of the work reported in this volume is actually biochemistry with the use of physical methods. It is not the aim of this reviewer to discourage the continuation of the present series, rather he would like to express the hope that the publishers might find it possible to develop a companion series covering the entire field of medical and biological physics. With the coming of age of Physical Medicine as a medical specialty there is a real need for an annual review of the fundamental research on which the development of the field is based. Such a review should cover biophysics in its entirety.

PHYSIKALISCHE THERAPIE. By *Josef Kowarschik,* Vienna. Cloth. Price, $13.50. Pp. 502, with 316 illustrations. Springer-Verlage,, Vienna, 1948.

This is the first physical medicine textbook from postwar Austria written by a well known clinician and teacher who during his thirty years activity has published several books on all phases of electrotherapy. As a matter of fact this volume is a sequel to the text "The Practice of Physical Therapy" published in 1937 jointly with Dr. A. Laqueur of Berlin and Ankara, an authority on hydrotherapy, who retired recently.

The contents of the sections on phototherapy and electrotherapy correspond largely with those of the earlier volume, having been brought up to date; it is interesting to note the substitution of the classification of long wave diathermy and short wave diathermy for the former terminology of "diathermy" and "short-wave" therapy, the latter term having been considerably overexploited by some others of the Vienna school. In the foreword the author complains that in Austria which gave physical medicine such pathfinders as Winternitz in hydrotherapy and Zeynek in diathermy, that subject is not taught in medical schools; he pointed to the progress made in this respect in other countries but especially in the United States. More than two-thirds of the book is devoted to the presentation of the physics, effects and technic of the various form of physical therapy, beginning with thermo- and hydrotherapy, adjoined by balneotherapy; after the sections on photo- and electrotherapy there is a section on "corrective gymnastics." The author recognizes three forms of "active" exercises: those for increase of muscular strength, those for increase of range of motion and those for improvement of coordination. The part on applied physical therapy presents a full discussion of the treatment of various disease groups and injuries, including, wherever indicated, the consideration of balneo- and climatotherapy. The text is profusely illustrated with pictures showing the various phases of technic and with diagrams showing physics of construction. The presentation is clear and conservative. It contains much information both from the standpoint of technic and of clinical

use that should be of interest to American readers who can read German. Only a teacher of such vast experience and knowledge as Kowarschik could bring out an up to date volume as this under the tragic political and economic circumstances of his small country.

EVALUATION OF DISABILITY AND REHABILITATION PROCEDURES OF PATIENTS WITH SPINAL CORD LESIONS. By *George G. Deaver,* M.D., Clinical Professor of Rehabilitation and Physical Medicine, New York University College of Medicine; Physician in Charge of Physical Medicine, Bellevue and Lenox Hill Hospitals; Medical Director, Institute for the Crippled and Disabled until May 31, 1947. "Studies in Rehabilitation," No. 3. Paper. Price, $1.00. Pp. 62. Institute for the Crippled and Disabled, 400 First Avenue, New York 10, N. Y., 1947.

The purpose of this monograph is to present methods for evaluating the disabilities resulting from spinal cord lesions and programs of exercises and activities necessary to meet the demands of daily living and working. The author points out that there are six main phases of treatment which must be considered in every patient with a spinal cord lesion: the neurologic, urologic, surgical, medical, psychologic and physical rehabilitation. Each is dealt with in the monograph. With reference to the phase of treatment, dealing with physical rehabilitation there are discussed the problems of maintaining normal range of motion at the joints, reeducation of muscle power if there is not a complete transsection of the cord and conditioning exercises to prepare the patient to meet the physical, mental, social and vocational demands of daily living and working to the maximum of his abilities and disabilities. This monograph is highly recommended to physicians, nurses and attendants concerned with the care of paraplegics. It is equally valuable for the patients who will find many answers to their questions.

PSYCHIATRY IN A TROUBLED WORLD. By *William C. Menninger,* M.D., General Secretary, The Menninger Foundation, Topeka, Kansas; Chief Consultant in Neuropsychiatry to the Surgeon General of the Army, 1943-1946. Cloth. Price, $6.00. Pp. 636. The Macmillan Company, 60 5th Ave., New York 11, N. Y., 1948.

The outstanding work of this author and clinician came to a new climax during World War II when chiefly under his inspired leadership psychiatry came to the fore in serving the armed forces and the country at large. This inspiring volume, the result of eighteen months of constant labor, has as its object to set down a record of the many psychiatric lessons learned painfully and at great cost during the war. The American public was surprised and shocked at the extent of psychological maladjustment revealed by the draft and in the armed forces of World War II. Through the war millions of people became really aware, for the first time, of the effect of the social environmental stresses on the personality. They learned that such stresses could interfere with or partially wreck an individual's efficiency and his satisfaction with life. The universality of neurotic reactions became evident to the layman. According to the author the only hope of meeting this rapidly increasing need lies in a greater knowledge of how to prevent mental illness. It is his contention that the chief implications of wartime psychiatric experience have to do with postwar life. In the first part of the book, "In War," he offers a résumé of psychiatric experiences in the Army. In the latter part, "In Peace," he shows how these experiences can be applied to various situations in civilian life. The author concludes that the potentialities of psychiatry for usefulness cannot be fully realized until three further steps are taken. Research activities in the field of psychiatry must be increased. The present desperate need for psychiatrists must be filled. Psychiatry must gain for itself an even wider acceptance and a more intelligent understanding by the public. An appendix of 63 pages contains a full list of publications and circulars and other reference data including nomenclature. This is a most valuable and exhaustive presentation of the neuropsychiatric problem as it exists today.

THE ACUTE BACTERIAL DISEASES. Their Diagnosis and Treatment. By *Harry F. Dowling,* M.D., F.A.C.P., Clinical Professor of Medicine, George Washington University; Chief, George Washington Medical Division, Gallinger Municipal Hospital. With the Collaboration of *Lewis K. Sweet,* M.D., Chief Medical Officer in Pediatrics and Infectious Diseases, Gallinger Municipal Hospital; Adjunct Clinical Professor of Pediatrics, George Washington and Georgetown Universities; and *Harold L. Hirsh,* M.D., Assistant Professor of Medicine, Georgetown University; Director of the Bacteriology and Immunology Laboratory, Georgetown University Hospital. Cloth. Pp. 465 with 55 figures. Price, $6.50. W. B. Saunders Company, 218 West Washington Square, Philadelphia 5, Pa., 1948.

Here is a book written by a man with much experience in the treatment of acute bacterial diseases. It emphasizes the importance of exact bacteriologic diagnosis so that specific and antibiotic therapy may be used early in the disease. Part I has to do with diagnosis, general measures in treatment, serum therapy, sulfonamide, penicillin and streptomycin therapy. Part II is a discussion of diseases caused by Bacilli and Part IV, diseases caused by bacteria in which exotoxins are a major factor. Perhaps no group of diseases in medicine lead to such catastrophic results if mishandled as do the acute bacterial diseases. With excellent and specific therapy now available it behooves the practicing physician to become thoroughly familiar with the latest concepts in diagnosis and treatment. This book can facilitate that end. It should see many editions.

DERMATOLOGY IN GENERAL PRACTICE. By *Sigmund S. Greenbaum,* B.S., M.D., F.A.C.P., Professor of Clinical Dermatology and Syphilology, University of Pennsylvania Graduate School of Medicine, Philadelphia. Fabrikoid. Price, $12. Pp. 889, with 846 illustrations. F. A. Davis Co., 1914-16 Cherry St., Philadelphia 3, 1947.

This book is designed for practitioners and undergraduates, who, from time to time desire facts as to diagnosis and therapeutics of the major dermatosis. The book has many fine pictures which demonstrate well the morbid anatomy of the disease in question. The diseases have been classified alphabetically which may make it somewhat difficult to use unless the physician knows the name of the disease in question. A great deal of time and effort has been expended by a man with considerable experience in the formation of this book.

PSYCHIATRIC INFORMATION FOR THE REHABILITTATION WORKER. Rehabilitation Standards Memorandum No. 18. Paper. Pp. 74. Federal Security Agency, Washington, D. C., 1948.

While the laymen's knowledge of the technical aspects of the field of neuropsychiatry may be limited, the effectiveness of his work with the emotionally disturbed person is dependent to a large extent on his attitude about mental illness. It is believed that this résumé will serve to create an awareness of the complexity of these problems and of the needs of the individual suffering from mental and emotional disabilities.

VOLUNTARY MEDICAL CARE INSURANCE IN THE UNITED STATES. By *Franz Coldmann,* M.D. Cloth. Price, $3.00. Pp. 217. Columbia University Press, 2960 Broadway, New York 27, N. Y., 1948.

Today practically everyone is discussing the economic aspects of medical care with arguments rational and otherwise. Many wish to retain the present system as the ideal for Americans; others and this includes a certain vociferous group advocate any change just so there is more and more government supervision and control; a few advocate plans that appeal to special groups and so on— no plan is perfect and no plan is satisfactory to all interested parties. However, that the future of medical care will be changed is obvious to everyone who realizes the alteration in the social pattern of the entire country.

In this book the author brings out the various plans that have been used. A chapter shows the development of such plans from the middle of the nineteenth century to the present. The first chapter sets forth the need and principle of medical insurance and what such plans have to offer the patient, the profession, the hospital and related groups. Subsequent chapters deal with the programs of the Blue Cross, Blue Shield, individual and group practice plans.

Each chapter discusses the various plans as to the legal aspects, eligibility, organization, rates, etc., and concludes with a consideration of the achievements and shortcomings.

Much practical information is available in this book which should interest not only all practicing physicians but the more intelligent lay person as well. The solution of the problem is not easy and much unbiased thought will be necessary. The author has successfully presented the subject without prejudice and in a comprehensive and readable manner.

MUSIC AND MEDICINE. Edited by *Dorothy M. Schullian* and *Max Schoen.* Pp. 499. Price, $6.50. Henry Schuman, Inc., 20 East 70th St., New York 21, N. Y., 1948.

This is a collection of scholarly essays by different authors presenting interesting information on the applications of music in medicine. The subject is dealt with from the point of view of the historian, musician, anthropologist and physician, including much theoretical material and a little experimental data. There is a tendency by each writer toward enthusiastic praise of music as a therapeutic agent without much substantiating objective proof. This book is worthy of study by all interested in this subject and may act to stimulate further research by investigators in the field of physical medicine and rehabilitation.

THERAPEUTIC AND INDUSTRIAL USES OF MUSIC. By *Doris Soibelman.* Pp. 274. Price, $3.00. Columbia University Press, 2960 Broadway, New York 27, N. Y., 1948.

This is a dispassionate and critical review of the more recent literature on the therapeutic value of music. It is highly recommended as a valuable reference for the use of physiatrists, occupational therapists, psychiatrists and educators and students in these fields as well as the lay musician interested in the application of music in medicine and industry.

A MANUAL OF CLINICAL THERAPEUTICS. By *Windsor C. Cutting,* M.D., Professor of Therapeutics, Stanford University School of Medicine, San Francisco, Calif. Second Edition, Illustrated. Cloth. Price, $5.00. Pp. 712. W. H. Saunders Company, Philadelphia, Pa., 1948.

This is the second edition of this fine little manual on therapeutics by a recognized authority in the field which presents the facts in a lucid and adequate manner while still managing to be brief and succinct. The book contains examples of all diets mentioned and up to date information on recent additions to our therapeutic armamentarium such as antihistamines, antithyroid drugs, new anticonvulsants, folic acid, fractions of plasma and pure digitalis glycosides. All drugs mentioned are listed alphabetically in an appendix giving exact dosage indications and principal toxic reactions. This book will be especially valuable to students, house officers and practitioners of general medicine.

A MANUAL OF THE TREATMENT OF FRACTURES. By *John A. Caldwell,* M.D., Professor of Clinical Surgery, College of Medicine, University of Cincinnati; Director of the Fracture Service, Cincinnati General Hospital, Cincinnati. Second edition. Pp. 152, with 76 illustrations. Price, $4.50. Charles C. Thomas, 301 East Lawrence Ave., Springfield, Illinois, 1947.

This brief text outlines the principles of treatment of fractures throughout the body, indicating the most widely accepted methods. The illustrations are excellent and indispensable in this type of treatise. Medical students, orthopedic nurses and physical therapists should find this valuable as a reference source. The physiatrist will be greatly disappointed to find that physical medicine is not mentioned, "frequent baking of joints" is advocated, and "physiotherapy" described as a "seance." There is no discussion of the problems of medical rehabilitation in fracture patients and the prevention of unnecessary invalidism.

SUPPLEMENTS TO THE BULLETIN OF THE HISTORY OF MEDICINE. Editor, *Henry E. Sigerist;* Associate Editor, *Genevieve Miller.* No. 5. PUBLIC BATHS AND HEALTH IN ENGLAND, 16TH-18TH CENTURY. By *Charles F. Mullett.* Paper. Price, $1.50. Pp. 85. The Johns Hopkins Press, Homewood, Baltimore 18, Maryland, 1948.

The relation between baths and health with its history of many hundred years has stimulated an extensive popular literature, ranging from the descriptive to the technical, the historical to the controversial, and the superficial to the exhaustive. This bibliographical essay presents a survey of the history of English baths during two centuries of their development. It is an imposing piece of research and reveals the great interest which English spas excited on part of physicians and public alike. Of the 470 references dealing specifically with "waters," 431 appeared before 1801, and of these, 414 were produced between 1660 and 1800, inclusive. Of the 431 citations, 234 were books, most of which went through more than one edition. The literature surveyed varies all the way from the most uncritical eulogies to acute chemical analyses. It touches some major controversies in medicine, notably Galenic versus Paracelsian; and it impinges on a wide variety of health regimens and theories. Although the Romans had popularized watering places in England, up to 1550, the fashion of taking the waters was not yet established, the subject had stimulated no literature, and Bath alone had a clientele.

Under the inspiration of Bath's fame and the simultaneous inability of Englishmen to visit continental spas because of international unrest, other English watering places began to boom. As the baths drew the fashionable and wealthy they likewise attracted vagrants; and Parliament sought to exclude "sturdy beggars" and to check the economic upset attendant upon unemployment. Other problems, especially of a social nature, followed the influx of diverse persons, since mixed bathing in the nude survived until after 1621. The search, pretended or real, for health soon inspired physicians to action, and after 1560 they strove to make balneotherapy as popular in England as it had long been on the continent. Moreover, they related bathing to other health regimens — dieting, moderate exercise, mild recreation, and music. A ritual of bathing emerged; laymen and physicians alike debated the merits of cold or hot baths. 1697 saw the first appearance of a famous work, Sir John Floyer's History of Cold Bathing, which had six editions in thirty-five years. Floyer supplied a table of the various cold baths of England with a discussion of their chemical properties. He also outlined the correct regimen to precede cold bathing — bleed, purge, diet. One should not bathe while too hot or stay in too long or bathe immediately after a meal; he should bathe regularly. To bolster his contentions Floyer cited both Hippocrates and canon law to show how many baptized infants had avoided disease. Another interesting volume was Russel's Dissertation on the Use of Sea Water in the Diseases of the Glands. The author praised sea water as promoting digestion and chylification and strongly recommended sea bathing, the salt being a stimulant and efficacious cleanser of the skin glands.

The Sea Bathing Infirmary at West-brook originated from the desire to extend the benefits of sea bathing to the poor. Opened for patients in 1796, its director and other members of the faculty supplied medical advice and medicine gratis. Several surgeons present expressed the belief that treatment at the infirmary had actually prevented amputations in a few cases. Among the most comprehensive and learned volumes was Dr. John Elliot's account of the principal mineral waters of Great Britain, Ireland, and the Continent. As a preface he included the tract by Joseph Priestley, "Of the Impregnation of Water with Fixed Air."

At the close of this excellent study the author expresses the hope regarding American Spas that the informed enthusiasm of physicians may not only revive the popularity of earlier American days but, what is of greater scientific, therapeutic, and even social significance, elevate balneology to the dignity of a respected and scientific branch of medicine. All physicians interested in physical medicine in general and balneology in particular will find a great deal of relevent and stimulating information in this volume. At the same time the editors of these inspiring "Supplements" deserve commendation for their choice of subjects.

THE HEALTHY HUNZAS. By *J. I. Rodale.* Cloth. Price, $2.75. Pp. 257, with illustrations. Rodale Press, Emmaus, Pa., 1948.

The final paragraph of the book might better be the opening, it would have saved a lot of unnecessary reading; quoting "I believe in the verity of every word I have written, but suppose some exaggeration has crept in. Even if you write off 30 per cent of the claims there is still suffi-

cient reason to investigate the Hunzas." The 30 per cent is certainly a conservative figure. The author maintains that this is an "authoritative piece of work, even though I never set foot in Hunza."

Much of the book is about everything but the healthy Hunzukuts. A better title might be — Good Manure and Health. It is really a zealous plea against artificial fertilizers. The author's lack of medical knowledge is pathetic, as an example he quotes an osteopath for the explanation of goiter as "carrying heavy articles on the heads and shoulders." Other similar bright bits of information are found on many pages. He attributes one of the Hunza's causes of good health because "he does not recline luxuriously on an overstuffed couch, reading a novel for hours at a time" — this reviewer might add that Hunzas keep their minds free and unblemished (if they do) by not reading trash we are expected to consume.

The author is not without his sense of humor when he says physicians are "a relatively intelligent class" and "psychiatrists (a generation ago) were practically being supported by old, crotchety millionaires who had an abundance of money and who wanted someone to listen to their troubles"; and his opinion of psychoanylists, whom he had need of in his younger days, and whose reaction he summed up by "those dozy monologues were too one sided. His part of the conversation was '$25.00, and see me next Tuesday'," and "chain smoking on the part of the mother may be a factor" why children are not breastfed.

The second last chapter consists of testimonial letters for the author's magazine and his manure farming and the last chapter is a plea for funds for the author's "Soil and Health Foundation." Oh, the happy, unsolicited, illiterate Hunzukuts!

Manure may be the cause of the health of the Hunzas and manure may be necessary to save the present and future generations but the way the manure is lauded in this work should not convince many that it leads to "health, happiness and productivity."

THE REHABILITATION OF THE PATIENT. SOCIAL CASEWORK IN MEDICINE. By *Caroline H. Elledge,* Assistant Professor of Social Work, McGill University, Montreal. With a Foreword by Philip D. Wilson, M.D. Cloth. Price, $2.50. Pp. 112. J. B. Lippincott Company, Philadelphia, London, Montreal, 1948.

This is a timely volume on an essential phase of medical rehabilitation. It stresses the scope and skill of medical social work in the problems of rehabilitation. Its five main chapters are: Whose job is rehabilitation? How does he feel about his handicap? What are his future possibilities? Some special considerations in success and failure. Teamwork in rehabilitation. Case histories are used to illustrate and emphasize the need for different methods of approach and for varied technics in the solution of the many different problems that are encountered by the medical and social worker. Factors involving ultimate success and failure are evaluated and the need for teamwork emphasized. The position of the medical social worker on the team is clearly defined as a go between in calling in the various professional experts needed to help solve the specific problem including the physician, the technician, the psychologist, the psychiatrist and the vocational councillor. The author correctly states that not all persons need social casework services in order to use other specialized rehabilitative facilities. Many persons can and do avail themselves of vocational guidance and placement services, for instance, and achieve satisfying and useful lives without other help. On the other hand, early recognition of signs and symptoms of personal difficulties by all members of the rehabilitation team may prevent prolonged, unnecessary suffering in the lives of those who have not only physical impairments but social and emotional handicaps as well.

SUBACUTE BACTERIAL ENDOCARDITIS. By *Emanuel Libman,* M.D., Late Consulting Physician, The Mount Sinai Hospital, New York City; and *Charles K. Friedberg,* M.D., Adjunct Physician, The Mount Sinai Hospital, New York City. Cloth. Price, $3.50. Pp. 116, with 19 illustrations. Oxford University Press, 114 Fifth Avenue, New York 11, N. Y., 1948.

The first edition of this monograph appeared in 1941; the present edition depicts the rapid advance in our knowledge from the period of almost no satisfactory therapy, through that of the use of the sulfonamides, to the present period of treatment with penicillin and, for some causative organisms not susceptible to penicillin, with streptomycin. The clinical aspect of subacute bacterial endocarditis has been changed very markedly since the introduction of antibiotic therapy. It was formerly usually fatal, often in a few weeks; a few patients, 4 per cent or less, recovered, but this recovery then was spontaneous rather than the result of treatment. With a specific antibiotic, chiefly penicillin, treatment of those patients, recognized early as having subacute bacterial endocarditis and treated intensively and intelligently, three-fourths or even more now recover. The physician in charge of these patients should not only know the etiology of the individual case but also understand the pathology, the clinical course and the possible complications of subacute bacterial endocarditis. The physician who has read this volume will be in an excellent position to treat effectively patients with subacute bacterial endocarditis.

PHYSICAL MEDICINE ABSTRACTS

Studies of the Pulmonary Circulation at Rest and During Exercise in Normal Individuals and in Patients with Chronic Pulmonary Disease. R. L. Riley; A. Himmelstein; H. L. Motley; H. M. Weiner, and A. Cournand.

Am. J. Physiol. **152**:372 (Feb. 1) 1948.

Studies of cardiac output and pulmonary arterial pressure were performed using the venous catheter technic in three normal individuals and in eight patients with various types of chronic pulmonary disease. Measurements were made at rest and during exercise on a stationary bicycle. Two of the three normal subjects showed a decrease in the mean pressure in the pulmonary artery during exercise; all showed a marked drop in pulmonary vascular resistance and a minimal increase in the work of the right ventricle during exercise. Three of the patients with chronic pulmonary disease showed a significant elevation of pulmonary arterial pressure at rest, and in all eight cases the mean pressure increased during exercise. There was either no change or an increase in the pulmonary vascular resistance during exercise, and the work of the right ventricle was invariably higher than in the normal subjects at a corresponding work level.

The observations indicate that the expansibility of the pulmonary vascular bed during exercise is limited in patients with chronic pulmonary disease. Anoxia may contribute to the elevation of pulmonary arterial pressure during exercise in those patients whose arterial oxygen saturation falls. The physiologic evidence on which an estimate of disability must be based in patients with chronic pulmonary disease is extended by studies of the pulmonary circulation during exercise.

Effect of Repeated Denervation Upon Neuromuscular Function. J. A. Morgan; J. D. Thomson, and H. M. Hines.

Am. J. Physiol. **153**:109 (April 1) 1948.

This investigation was prompted by reports that functional recovery of partially denervated skeletal muscle could be enhanced by increasing the degree of reinnervation through branching of remaining viable axons, a process known as neurotripsy.

The left tibial nerves of 120 female albino rats were crushed once, twice or three times, at intervals of forty-two days. Strength and wet weight of the muscles supplied by these nerves were measured at twenty-one, forty-two and eighty-four days after the terminal lesion and compared with values obtained from unoperated control muscles. Comparisons were also made between muscles whose nerves had been crushed twice or three times and those whose nerves had been crushed only once.

Measurements of weight changes (calculated on the basis of muscle cell phase changes), tension per gram of contractile tissue (elicited by both indirect and direct stimulation) and tension by nerve stimulation in per cent of tension by direct stimulation show that (a) during the predominantly degenerative phase (twenty-one days after the last lesion) values from one, two and three crushes showed no significant variation; (b) during the predominantly regenerative phase (forty-two days) values were slightly higher after two and three crushes than after one, and (c) during the phase of nearly complete recovery (eighty-four days) values after two crushes were very nearly the same as after a single crush.

These results indicate that skeletal muscle can undergo repeated cycles of denervation atrophy and recovery without being significantly impaired in its regenerative capacity. The accumulative effect of such procedures are of small magnitude and point in the direction of a more effective reinnervation and recovery during the regenerative phase.

Some Efficacious Methods in Physical Medicine. Shoulder Raising and Neck Exercises in the Treatment of Brachial Neuralgia. K. N. Lloyd.

Brit. J. Phys. Med. **11**:81 (May-June) 1948.

There are four common causes of brachial neuralgia, which are (1) what can best be termed "the thoracic-outlet syndrome," (2) osteoarthritis of the cervical spine, (3) herniation of a cervical intervertebral disc, either frankly traumatic or in association with osteoarthritis and (4) fibrositis of the shoulder-girdle muscles.

Of the other causes of brachial neuralgia, osteoarthritis of the cervical spine may cause it by encroachment of osteophytes into the intervertebral foramina, thus irritating or compressing the nerve roots. If treatment be directed towards restoration of muscle power and tone by active exercises of the neck in all directions, considerable symptomatic relief should be expected and in fact does occur, the addition of deep heat, in the form of short-wave diathermy to the affected area, being a valuable adjunct by increasing the local blood supply. Diathermy treatment is given before exerises are undertaken.

Tuberculous Cervical Adenitis. H. Bailey.

Lancet 1:313 (Feb. 28) 1948.

Bailey reviews the rise of surgical treatment in the period between 1885 and 1908 and its subsequent fall and replacement by heliotherapy and roentgen treatment. During the last twenty years treatment with roentgen rays has declined in favor, since it is not without serious disadvantages. It converts the skin into leather and produces underlying fibrosis. Occasionally roentgenologic burns are encountered. On rare occasions malignant disease follows irradiation. Tonsils, adenoids and carious teeth are the chief portals of entry for the tubercle bacillus into the cervical lymphatic system. Bailey describes the four progressive stages of tuberculosis in the cervical lymphatic system and discusses treatment by aspiration, giving particular attention to the causes of the high proportion of bad results following aspiration. Curettage is not divorced from the disaster of disseminating tuberculosis. The procedure should be abandoned. Surgeons familiar with thyroid surgery and many progressive otorhinolaryngologists are especially adaptable to this work. Any surgeon with a good knowledge of the anatomy of the neck can quickly become adept, provided he has the time and patience to undertake the dissections. Diseased tonsils and especially adenoids should be removed by an otorhinolaryngologist or a surgeon especially trained in the removal of adenoids. Provision should be made for adequate convalescence up to two or three months in an institution with a nurse especially trained in the correct method of dressing open wounds.

Some Points in Management of Infantile Cerebral Palsy. John H. Crosland.

Proc. Roy. Soc. Med. 41:406 (June) 1948.

The earlier treatment can commence the better, and an age of one year is certainly not too young. There are obvious risks of maldiagnosis in starting at this age, and it is not easy to determine whether the child be intelligent or not, but there is one great advantage in that the child does not develop bad movement patterns in the endeavor to overcome his handicap himself, and further the right environment can be ensured. In the older child these bad habits of movement superimposed on the original handicap are difficult to deal with and make the best results almost impossible of attainment.

Where there is not gross athetoid movement, the child should be encouraged to roll and kick on the floor, and he may be allowed to crawl, but he should not be allowed to stand or walk until his reablement program is well advanced.

As treatment programs are long and may continue for months at a time, it is most important that the child's interest in his treatment should be aroused and maintained. To this end his rehabilitation must be made as attractive as possible, and one good plan is to teach him exercises, to the sound of an easily learned tune, preferably sung to him, in order that he may get the sense of the words as well.

Due to the natural enthusiasm of teachers and therapists there is danger of overworking the child and overtaxing his powers of concentration. Programs must therefore be carefully worked out with this in mind, and adequate rest periods provided.

Passing to the spastic type of cerebral palsy, it will be found that these children are often extremely fearful. They must therefore at all times feel perfectly secure. Treatment tables must be wide enough to give them this feeling of security and they must be handled firmly and competently. At the same time a scheme of exercises is made out for the reeducation of their limb muscles, and when as much improvement in pelvic control as possible has been obtained they can pass to practice in sitting unsupported, kneeling, standing and finally walking. It is useful to get as much aid from gravity as possible by posturing the child in his exercises. Thus he may be placed head downwards on a tilted table where the pectoral muscles are spastic. Again, where the dorsiflexors of the foot are weak, he may be placed on his abdomen with his legs at right angles to the table. In the child with athetosis the keynote of management is relaxation. If he can be taught to relax efficiently, he can lose a great deal of his unwanted movements. It is important that these children should have really adequate rest periods because of the greatly increased amount of energy consumed by this uncontrolled movement. When relaxation has been achieved as well as may be, he must be taught new movements of the affected limbs which are purposive movements under his own volitional control.

Occupational therapy is an important part of the management of most types of cerebral palsy. It has little part where the arms are unaffected. Its main sphere is to teach the child to carry over into every day actions what has been taught him by the physical therapist. That is to say, he is taught to feed himself to dress himself, and this is carried out by practice with various feeding aids, such as drinking straws, special plates, spoons, etc. In learning to dress, the child will first practice buttoning, lacing, on models held immovably in frames. He is also taught the movements of writing, and, if it is thought he will not be able to achieve this legibly, he is taught to use a typewriter. While the athetoid child is being taught these skills the occupational therapist must see that the rest of his body is maintained in the relaxed position.

Infantile Cerebral Palsy. Philip Rainsford Evans.

Proc. Roy. Soc. Med. 41:402 (June) 1948.

The incidence of infantile cerebral palsy has been estimated by Duryea to be 50 patients per 100,000 of the population in the United States. According to Phelps the figures are similar in

urban and rural districts, and may be expressed as: 7 born each year per 100,000 population; 1 dies in infancy; 2 are mentally defective; 4 are educable, of whom 1 is mildly, 2 moderately, and 1 severely afflicted.

Thus for every 100,000 people there are probably 30 children who are moderately affected and who need special education and therapy. At this rate London would have to cope with over 2,000 children with cerebral palsy who need these special methods, and perhaps another 3,000 who are so severely handicapped mentally or physically that they need to be cared for in institutions. It must be emphasized that there are no figures on which an estimate of the incidence in England can be based. A survey is needed. The two residential units open in England accommodate some 50 children and the pathetic quest of the parents for adequate treatment for their handicapped children is marked by recurring disappointment.

Thermal Arsenic Treatment for Adult Complaints. H. Jumon.

Gaz. Méd. de France 54:287, 1947.

Thermal arsenic treatment, the waters of Bourbole, is of great benefit to the dermatoses: pruritus, prurigo, lichenifications, eczema, acne, psoriasis and lupus. Patients with respiratory affections also benefit, except for the tuberculous, who must be studiously excluded. Good results have been obtained in cases of mucous and mucopurulent catarrhs of the nasopharynx, congestive rhinitis and recurrent tracheobronchitis; cases of bronchiectasis are to be excluded. Asthma in adults is improved only in cases with spaced acute attacks dating from infancy. Some improvement is noted also in certain cases of amenorrhoea, dysmenorrhoea and anemias of warm climates.

Alkalimetry of Medicinal Spa-Waters. A. C. Perez.

Excerpta Med. 2:801 (June) 1948.

The therapeutic properties of medicinal spring waters are in part due to their richness in alkali radicles; thus alkalimeteric analysis of all medicinal waters is desirable. The factors governing alkalimetry are the neutrality of the salts, their concentration and the various proportions in which they are present. A list of the alkali values of various Spanish natural waters is added.

An Electronic Controller of Volleys in Electrical Stimulation. Alexander Mauro, and Samuel P. W. Black.

Yale J. Biol. & Med. 20:567 (July) 1948.

In neurophysiologic investigation there is often need for a device which can precisely control the duration and repetition rate of a volley of electrical stimuli delivered to the tissue under observation. An electronic circuit was designed and built to meet that need and is described in this article.

Food Intake as a Mechanism of Temperature Regulation. John R. Brobeck.

Yale J. Biol. & Med. 26:544 (July) 1948.

When exposed for 18 hours to temperatures between 65 and 76 F., adult male rats increased their food intake, gained weight normally, and avoided hypothermia. At temperatures above 92 F. food intake was low, water intake was somewhat increased, and the rats lost weight rapidly and experienced fever. These data indicate that food intake is not necessarily determined by total energy expenditure, nor by the animal's body temperature. Rather, food intake appears to be controlled as if it is a mechanism of temperature regulation. The amount of food eaten appears to be determined, at least partly, by the organism's ability to dissipate the heat of food metabolism.

Physical Reconditioning in Japan. Noel H. Petree.

Bull. U. S. Army Med. Dept. 7:547 (July) 1948.

Physical reconditioning has contributed to the speedier return of military patients to usefulness in Japan. According to the author, the full realization of the importance of exercise with respect to specific and general disabilities will be advanced through (1) assigning to full-time duty officer and enlisted personnel trained in technics and knowledge of physical reconditioning that will enable medical staffs to transmit prescriptions for exercise in precise dosage; (2) defining the areas to be treated by physical therapy, occupational therapy and physical reconditioning; and (3) setting up lower levels of exercise that may invite medical officers to direct earlier assignment of patients to the physical reconditioning program.

The Shoulder-Hand Syndrome in Reflex Dystrophy of the Upper Extremity. Otto Steinbrocker; Norman Spitzer, and H. Harold Friedman.

Ann. Int. Med. 29:22 (July) 1948.

A variety of seemingly unrelated clinical disorders, usually considered distinct entities, have been described in the surgical and medical literature for many years. These conditions include causalgia, Sudeck's atrophy (post-traumatic osteoporosis), painful disability of the shoulder following coronary occlusion, postinfarctional sclerodactylia, palmar and digital contractures as well as Dupuytren's contracture, the swollen atrophic hand associated with cervical osteoarthritis, certain changes in the paretic limbs of hemiplegics, and a number of others. In this group belongs the idiopathic shoulder-hand syndrome. It is becoming increasingly apparent that, although the etiology of these various syndromes may be different, many of the clinical features, and probably the neurovascular mechanisms underlying their development, are very similar, if not identical.

Immobilization of the affected parts in conjunc-

tion with the various modalities of physical therapy — heat in all forms, heliotherapy and massage have been utilized extensively. These measures, apart from giving temporary palliation, seem to exert little influence on the course of the disease. Oppenheimer, on the other hand, employed short-wave diathermy to the cervical spine and in six of seven cases with swelling and atrophy of the hand secondary to cervical osteoarthritis he reported recovery. The results of the authors with this form of treatment have not been impressive.

Manipulative procedures have been widely condemned. Manipulation of the shoulder, especially, in these cases is apt to be based on a misdiagnosis of bursitis, fibrositis and, possibly, scalenus anticus syndrome. The shoulder discomfort and disability frequently are regarded as symptoms complicating, or unrelated to, the hand signs. Such deductions usually represent a failure to correlate the salient features of the shoulder-hand syndrome.

The Role of Physiotherapy in the Treatment of Poliomyelitis. F. S. Cooksey.

Proc. Roy. Soc. Med. **41**:395 (June) 1948.

Some time between six months and two years it becomes obvious that no further improvement is likely to be obtained in the weak muscles by graduated exercise. This is a difficult decision to make and the point is reached so gradually that it is apt to be overlooked with the result that the expectant treatment is continued too long with unnecessary financial hardship to the patient. A physical therapist who has been coaxing weak muscles for many months is liable to underestimate the degree of recovery at this stage and consequently it is important for the physician to check the voluntary power record frequently at this period.

Radioactive Tracer Technics and Their Possible Application to Studies in Syphilis. Paul D. Rosahn.

Am. J. Syph., Gonor. & Ven. Dis. **32**:307 (July) 1948.

The utilization of tracer technics in the study of biologic problems is in its infancy, and investigators currently employing this technic have found that much time and thought must be given to instrumentation and apparatus. Furthermore, it is generally agreed that studies employing tracer methods require the cooperative efforts of a team of scientists including biologist, physicist and chemist. The work is tedious, time-consuming and expensive and requires generous support. The science is young and undeveloped. Much can be accomplished through judicious encouragement of men and ideas. In the field of syphilis, several investigative centers should be organized, or the laboratories already familiar with tracer methods should be invited to pursue some of the problems outlined herein and others of their own selection. The problem is too vast to be confined to one laboratory. Only through the cooperative activities of several laboratories will some of the answers we seek be obtained.

Diathermy Treatment of Retinal Angioma. P. M. Lewis.

Am. J. Ophth. **31**:829 (July) 1948.

Two patients with angiomatosis retinae were treated by diathermy coagulation and observed for five and one-half years and three years, respectively. The first was an advanced case and while the angioma and large vessels were destroyed and the eyeball preserved, vision was not restored. The second case was early. The angioma was destroyed and normal vision was present after thirty-four months. Due to the progressive nature of angiomatosis retinae it seems that all cases uncomplicated by intracranial or other serious involvement should be given the benefit of some type of treatment to destroy the tumors. Diathermy offers the best method for single angiomas, particularly when located far in the periphery. It is felt at present that the combination of surface diathermy along with multiple punctures into and around the angioma is, in the majority of cases, the procedure of choice.

Effect of Delay of Innervation on Recovery of Muscle After Nerve Lesions. E. Gutmann.

J. Neurophysiol. **11**:279 (July) 1948.

Nerve suture following peripheral nerve injury in man is performed at various periods after injury. It is concluded that up to a period of eight months of denervation, the poor degree of functional recovery following reinnervation is due to deficient maturation of the nerve fibers and to deficiency of the newly formed contact between nerve and muscle fibers. The rate of regeneration of nerve fibers is apparently not affected after such periods of denervation. After longer periods, recovery of muscle fibers becomes more deficient, the degree of muscle atrophy being then apparently a decisive factor in limiting functional recovery.

A Study of Physical Activity in Juvenile Diabetic Patients. Robert L. Jackson, and Helen G. Kelly.

J. Pediat. **33**:1551 (Aug.) 1948.

Exercise was known to be an important factor in the treatment of diabetes mellitus long before the discovery of insulin. Since the discovery of insulin and the advances made in its refinement and modification, along with the recent rapid advances in the knowledge of nutrition, exercise as a factor in the treatment of diabetic patients has received little attention.

In 1940 the method was described for stabiliza-

tion of children with diabetes mellitus. The regimen outlined has been effective, and a large number of children have been able to maintain excellent regulation over extended periods of time.

In a study of exercise under home regulation, evaluation was limited to the well-regulated patients because these subjects generally keep better records than those who maintain a lower level of diabetic control. It is obvious that a well-kept record is essential when the relation of exercise to diabetic regulation is being studied.

Presumably when the well-regulated diabetic child exercises more than usual, he utilizes his glucose directly for energy and he has an excess of insulin available to convert glucose into glycogen. The loss of glucose from the blood, both by utilization and storage, easily may result in hypoglycemia. If the patient has mild diabetes mellitus requiring only a small amount of exogenous insulin, his ability to compensate will be enhanced by the depression of the endogenous insulin. If the disease is severe, requiring a large amount of exogenous insulin, the patient will have a smaller threshold of safety.

It has been observed that if the diabetes of the child is well regulated and he maintains good control, later when he becomes more mature physically and mentally he is freer from shocks of all types. The adolescent or young adult learns to judge his tolerance for exercise and his need to compensate by eating extra food for unusual periods of strenuous exercise. The adolescent hanced by the depression of the endogenous insuhe needs, in order to prevent erratic and excessive compensation and poor dietary habits. It is preferable that extra food be eaten at meal times. For the young adult, the privilege of eating socially after an evening party, dance, or game has psychologic and social advantages and is provided for in the regimen under discussion.

Reiter's Disease; Report of Five Cases Including Two Successfully Treated with Hyperthermia. Edward W. Lowman, and Robert J. Boucek.

Ann. Int. Med. **28**:1075 (June) 1948.

Reports of the triad of urethritis, conjunctivitis and arthritis (so-called Reiter's disease) have appeared more and more frequently in the literature since its initial presentation by Reiter in 1916. This represents in all probability not an increase in the incidence of the condition but a more frequent consideration of the triad in differential diagnosis. There have been few reports of successful therapy, and the general tone by inference or conclusion has been that there is no specific treatment for the disease. In this series, five cases were seen, two of which were treated with hyperthermia and penicillin.

Five cases of Reiter's disease are presented. Four are typical cases with classical, triad of symptoms while the fifth probably represents an incomplete syndrome without the conjunctivitis.

Two of the cases presenting the complete triad responded to treatment with artificial hyyperthermia and penicillin and promptly went into remission. These cases had been chronically ill for six and seven months, respectively. Follow-up examinations after four and six months, respectively, showed no recurrence.

Preventive Orthopedics in the Treatment of Poliomyelitis. John F. Pohl.

J. Pediat. **33**:208 (Aug.) 1948.

The general plan of management which was carried out in 1946, as in previous years, was to hospitalize every patient until spasm and muscle shortening had been overcome and each patient had also been retrained as thoroughly as possible in the normal motor patterns. Treatment of the peripheral tissues consisted primarily of complete rest in bed with prompt and intensive application of moist heat to all areas affected by spasm. As pain and sensitivity disappeared, gentle manipulation and manual release of the shortened tissues was used where necessary in conjunction with the moist heat. Incipient deformities from muscle shortening responded to this treatment as spasm was overcome.

The period of hospitalization of the 1,057 surviving patients of the 1946 epidemic averaged twenty-one days for the thirty-three patients with abortive cases (those with clinical symptoms other than paralysis, but having a normal spinal fluid cell count); twenty-three days for the 356 nonparalytic patients; and according to the author, will average from two to fourteen months for the paralytic patients, depending on the severity of attack. It was estimated that nine patients will require a stay of two years.

General Practice. James L. Hammer.

South. Med. & Surg. **110**:209 (July) 1948.

The commonest cause of persistent lumbosacral pain is degeneration or traumatic injury of the intervertebral disc. The diagnosis of herniated disc depends on study of the history of the case, on evaluation of the symptoms and on the result of a neurologic examination for areas of hypalgesia and alteration of the knee and angle jerks. Treatment of acute lowback strain consists primarily of rest and graduated physical activity on a semirigid mattress. Any flexion contracture of the hips suggests the addition of flexion of the knees to flatten lumbar lordosis; this may be added to any strain for comfort. Rest on either side in similar position is allowed if comfortable. A strain having no nerve systems is seldom improved by leg traction. Diathermy, infra-red radiation or hot packs afford relief and shorten convalescence. When improvement justifies change to ambulatoryy treatment, support by adhesive strapping or corset is added. Activity is restricted for at least three months. Of particular importance is the equalization of leg length by shoe elevation. Minor shortening of a leg is common and causes little difficulty. The addition of a

strain in the lowback area to leg length is prone to cause symptoms.

Under certain conditions as in pregnancy, obesity, muscular weakness or bone deficiency, the line of gravity is moved posterior to the sacroiliac joint and balance of the body is then possible only by excessive muscular effort or by accentuating the lumbar lordosis with secondary increase in the angle of pelvic inclination, a flexed position of the hips and dorsal kyphosis. In strain of the lowback structures, posture improvement will contribute greatly to clinical improvement. This improvement follows the use of supports to decrease abdominal prominence of lumbar lordosis and the medical treatment of the underlying general deficiency.

Electric Convulsive Therapy in Mental Disorders Associated with Childbearing. David A. Boyd, and Dewitt W. Brown.

J. Missouri M. A. **45**:573 (Aug.) 1948.

Electroconvulsive therapy has had sufficient clinical trial to establish its value and comparative safety in mental disorders associated with childbearing. Its utilization should be considered seriously in all cases of manicdepressive and schizophrenic disorders of the gestational and puerperal periods. The decision of whether or not it is to be instituted should be based on the total treatment needs of the patient, and the greater emphasis should be placed on the psychiatric indications rather than on the physical condition of the puerperal status.

The early utilization of electroshock treatment in puerperal manicdepressive and schizophrenic psychoses will shorten the duration of illness, reduce the medical and nursing problems and produce a better rate of recovery than any of the previous forms of treatment. In gestational psychoses it often makes it possible to carry the pregnancy to term and simultaneously improve the physical condition of the mother. The course of therapy should be instituted as soon as the diagnosis can be established inasmuch as the dangers of chronic mental invalidism are fully as great as the physical hazards.

The Use of Physical Agents in General Practice. Walter J. Lee.

Southern M. J. **41**:655 (July) 1948.

The active cooperation of the arthritic patient is essential for obtaining satisfactory results in mobilizing joints and maintaining good muscle tone. In the early acute stage complete rest of the joint is indicated. Proper positioning and splinting are necessary during this early phase, and static of muscle-setting exercises only are used. Watkins says that as the inflammatory process subsides carefully graded active exercises may be initiated; at first consisting of active assisted motions and later of voluntary exercise. Resistive exercises are rarely indicated because of the tendency toward subluxation. As the process becomes chronic or a remission occurs, active resistive exercises can be instituted. These exercises are to be carefully graded and purposeful being directed primarily toward gait and posture training. For developing strength, coordination and skill in the upper extremities occupational therapy is utilized. Mental as well as physical function is stimulated by this method. Occupational therapy can consist of anything, from weaving a rug to driving a nail provided the exercise performed is interesting, purposeful and directed toward improvement of function. Occupational therapy may also take the form of pre-vocational training as a part of adequate rehabilitation.

Rheumatoid spondylitis provides a condition to illustrate the value of special exercises in the prevention and treatment of disability. Deep breathing and postural exercises are a valuable adjunct when combined with roentgenotherapy and other recognized procedures.

Since rheumatoid arthritis tends toward chronicity, physical measures that can be utilized in the home each day are to be recommended. Treusch and Krusen reported a survey of home physical therapy in 229 cases of arthritis, and found that 93 per cent of the patients followed the instructions for home therapy and 65 per cent continued them for three months or longer. They observed that patients with more than one course of instruction were more likely to carry on. Four-fifths of the patients were definitely benefited, and two-fifths were enthusiastic over the regimen. How physical agents may be used in general practice has been illustrated in the treatment of arthritis.

Treatment of Peripheral Nerve Injuries. Winchell McK. Craig.

Mil. Surg. **103**:1 (July) 1948.

The surgical treatment of peripheral nerve injuries is one small part in the entire treatment. Injury to a peripheral nerve affects the extremity which that nerve supplies, and an extremity which has been denervated is obviously incapable of performing normal activities. Not only is the muscular activity interfered with, but the vascular and trophic phases are so altered that there is discomfort and disability.

A greater appreciation of splintage has been acquired as the evils of immobile casts and lack of exercise of muscles and joints involved was indelibly impressed on the minds of the surgeons and physiatrists who attempted final rehabilitation. Splinting applied for support and allowing movements of adjacent joints is of value. Passive motion and gentle massage maintain better metabolism of the muscles and create a more receptive condition for reinnervation.

It has been proved that an evaluation of return of function after injuries to peripheral nerves cannot be reached until several years have elapsed. Not only must there be a complete regeneration of the nerve but there must be an adjustment period during which the muscles of finer coordination must be reeducated.

Development of Ultraviolet Blood Irradiation. E. K. Knott.

Am. J. Surg. **66**:165 (Aug.) 1948.

The development of ultraviolet blood irradiation therapy was an outgrowth of an attempt to utilize the bactericidal properties of ultraviolet rays in the treatment of blood stream infections. If the greatest advantage was to be derived from the bactericidal properties of the rays, a method of applying them directly to the blood stream of the patient had to be developed. The problem faced was twofold in nature: (1) to develop a method of application and (2) to determine the necessary dosage. Thus ultraviolet blood irradiation therapy must be considered as a powerful therapeutic agent which the skilled physician and surgeon can use in a wide variety of disease processes, since in using this method one is applying certain fundamental biochemical and physiologic effects. The favorable results experienced from the clinical use of the ultraviolet blood irradiation certainly warrant extensive investigation of the modus operandi of the procedure and detailed, intensive clinical studies to determine fully its potentialities.

The Study of Peripheral Vascular Disease with Radioactive Isotopes — Part 1. Daniel C. Elkin; F. W. Cooper, Jr.; R. H. Rohrer, W. B. Miller, Jr.; Patrick C. Shea, Jr., and E. W. Dennis.

Surg., Gynec. & Obst. **87**:1 (July) 1948.

Two methods for the use of radioactive sodium 24 in the investigation of circulatory physiology of the extremities are compared and discussed. The apparatus is described in detail. The results of one of the methods used in a series of normal individuals are evaluated. (The results of the other methods, are to be published later.)

Open Forum. Radioactive Isotopes in Medicine. T. Swann Harding.

M. Record **161**:326 (June-July) 1948.

Stable isotopes are not radioactive and usually have to be recognized by use of the spectrometer. But, by suitable combinations of radioactive and stable isotopic atoms in molecules it may prove possible to follow their chemical mutations with greater accuracy. Heavy water, carbon 13, and nitrogen 15 are prominent representatives of interesting and useful stable isotopes.

It may also be well to avoid the use of long-lived isotopes like carbon 14, in tracer experiments involving human beings, because of its dangerous emission of alpha particles, and to use nonradioactive carbon 13 instead. In general, radioactive isotopes with shorter half-life, especially those that emit beta rays — as well as some which emit gamma, may be used in dosages too small to have an observable biological effect but sufficiently large to be traced and thus useful in biological experimentation.

Some Modern Uses of Luminous Energy Therapy. Edward C. Titus.

M. Record **161**:275 (May) 1948.

In this brief review of the subject of luminous energy and cognate matters, the writer has been able to present suggestions concerning the use of dependable remedial agents which will be helpful to the other physicians.

Electroshock Therapy, Clinical and Electroencephalographic Studies. A. Mosovich, and S. Katzenelbogen.

J. Nerv. & Ment. Dis. **107**:517 (June) 1948.

In brief, an abnormal record before treatment suggests two significant aspects: It appears to be less favorable for the outcome of the treatment than a normal record; it is more likely to induce cerebral dysrhythmia of more or less long standing than a normal electroencephalographic record.

Isotopes in Clinical and Experimental Medicine. John H. Lawrence.

California Med. **69**:58 (July) 1948.

In summary it may be observed that the role in therapy of radioactive isotopes and of those stable species that can also be adapted to the production of ionization in tissues is still in a primitive stage of development. Unquestionably, the future will see great expansion in the knowledge of their usefulness and practical application. The use of the new types of radioactivity must, however, be approached with caution. It has long been known that ionizing radiation in addition to its acute effects may have such chronic manifestation as the induction of malignant change in tissue. Radium-induced bone sarcomata have been observed for many years. Recently, Lisco, Finkel and Bruce have shown that both radiostrontium —SR and plutonium — Pu — can produce bone tumors in mice, particularly the former. This has particular significance for the possible use in man of long-lived isotopes of elements that concentrate in bone — as for example, many of the fission product elements.